

## **Historic, Archive Document**

Do not assume content reflects current scientific knowledge, policies, or practices.









OFFICE OF MANAGEMENT SERVICES  
DBF - BUDGET BRANCH  
CENTRAL FILES







VOLUME NO. 2

EXPLANATORY NOTES

FOR

DEPARTMENT OF AGRICULTURE

BUDGET ESTIMATES

U.S.D.A.

National Agricultural Library

Received

FISCAL YEAR

1940

Procurement Section  
Current Serial Records

Contents

	Pages
Forest Service .....	231 - 310
Bureau of Chemistry and Soils.....	312
Bureau of Agricultural Chemistry and Engineering.....	312 - 333
Bureau of Entomology and Plant Quarantine.....	334 - 411
Bureau of Biological Survey.....	412 - 444





C O N T E N T S

(Volume 2)

Pages

## FOREST SERVICE:

General statement.....	231
Salaries and expenses:	
Preamble.....	231 - 233
General administrative expenses.....	233 - 234
National forest protection and management.....	234 - 258
Reconstruction and repair of roads and other improvements, national forests in California.....	258 - 259
Water rights.....	259 - 260
Fighting forest fires.....	260 - 261
Private forestry cooperation.....	261 - 263
Forest research:	
Forest management investigations.....	263 - 267
Range investigations.....	267 - 269
Forest products investigations.....	269 - 277
Forest survey.....	277 - 279
Forest economics.....	280 - 285
Forest influences investigations.....	286 - 289
Tropical forest experiment station.....	289 - 290
Forest-fire cooperation.....	291 - 293
Cooperative distribution of forest planting stock.....	294 - 295
Acquisition of lands for national forests.....	296 - 297
Acquisition of land, Uinta and Wasatch national forests, Utah....	297
Acquisition of land from national forest receipts (receipt limitation).....	297 - 300
Payments to States and Territories, national forests fund.....	300
Payments to school funds, Arizona and New Mexico, national forests fund.....	300 - 301
Roads and trails for States, national forests fund.....	301
Cooperative work, Forest Service.....	302
Supplemental funds.....	303 - 309
Passenger-carrying vehicles.....	310

BUREAU OF CHEMISTRY AND SOILS.....	311
------------------------------------	-----

## BUREAU OF AGRICULTURAL CHEMISTRY AND ENGINEERING:

Statement of transfers.....	312
Salaries and expenses:	
General administrative expenses.....	313
Agricultural chemical investigations.....	313 - 318
Industrial utilization of farm products and by-products.....	319 - 320
Agricultural fires and explosive dusts.....	320
Agricultural engineering investigations.....	320 - 328
Naval stores investigations.....	328 - 329
Soil survey.....	329



Pages

## BUREAU OF AGRICULTURAL CHEMISTRY AND ENGINEERING - Continued.

## Salaries and expenses - continued.

Soil chemical and physical investigations.....	329
Fertilizer investigations.....	329 - 330
Supplemental funds.....	331 - 332
Passenger-carrying vehicles.....	333

## BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE:

## Salaries and expenses:

General administrative expenses.....	334
Fruit insects.....	335 - 339
Japanese beetle control.....	340 - 343
Mexican fruit fly control.....	343 - 345
Citrus-canker eradication.....	345 - 346
Sweetpotato weevil control.....	346 - 348
Phony peach and peach mosaic eradication.....	348 - 349
Forest insects.....	350 - 355
Gypsy and brown-tail moth control.....	356 - 357
Blister rust control.....	358 - 360
Dutch elm disease eradication.....	361 - 363
Truck crop and garden insects.....	363 - 368
Cereal and forage insects.....	368 - 375
European corn borer control.....	376
Barberry eradication.....	377 - 378
Cotton insects.....	379 - 383
Pink bollworm control.....	383 - 386
Thurberia weevil control.....	386 - 387
Bee culture.....	388 - 390
Insects affecting man and animals.....	390 - 393
Insect pest survey and identification.....	394 - 395
Foreign parasites.....	396 - 397
Control investigations.....	397 - 399
Insecticide and fungicide investigations.....	399 - 402
Transit inspection.....	403
Foreign plant quarantines.....	404 - 405
Certification of exports.....	406
Screwworm control.....	406
Control of emergency outbreaks of insect pests and plant diseases.....	407 - 409
Supplemental funds.....	409 - 410
Passenger-carrying vehicles.....	411

## BUREAU OF BIOLOGICAL SURVEY:

## Salaries and expenses:

General administrative expenses.....	412
Food habits of birds and animals.....	413 - 415
Fur-resources investigations.....	415 - 417
Biological investigations.....	418 - 421



BUREAU OF BIOLOGICAL SURVEY - Continued.		<u>Pages</u>
Salaries and expenses - continued.		
Control of predatory animals and injurious rodents.....	421 - 422	
Protection of migratory birds.....	423 - 425	
Enforcement of Alaska game law.....	426 - 427	
Maintenance of mammal and bird reservations.....	428 - 431	
Migratory bird conservation refuges.....	432 - 433	
Upper Mississippi River wildlife refuge.....	434 - 435	
Migratory bird conservation fund.....	435 - 437	
Federal aid to States in wildlife restoration projects.....	438 - 441	
Payments to counties under migratory bird conservation act.....	442 - 443	
Supplemental funds.....	443	
Passenger-carrying vehicles.....	444	

-oOo-

7 8





FOREST SERVICEGeneral Statement

In summary, the increases and decreases in regular funds under the 1940 budget for the Forest Service consists of:

Increases:

National Forest Protection and Management:		
Forest Fire Prevention.....	\$34,246	
Blister Rust Control.....	500,000	
Grazing Use.....	75,000	
Logging national-forest timber.....	500,000	\$1,109,246
Private Forestry Cooperation.....	25,000	
Forest Products Investigations.....	71,639	
Forest Economics.....	10,000	
Tropical Forest Experiment Station (new item) ..	30,000	
Payments to States and Territories from		
National Forest Fund.....	160,300	
Acquisition of Land from National Forest		
Receipts.....	<u>21,000</u>	
Total increases.....		1,427,185

Decreases:

Acquisition of Lands for National Forests.....	1,000,000
Forest Roads and Trails:	
Forest Highways.....	783,333
Forest Roads Development.....	<u>1,216,667</u>
Total decreases.....	<u>3,000,000</u>
Net decrease.....	<u><u>1,572,815</u></u>

## (a) SALARIES AND EXPENSES - PREAMBLE

Changes in Language

Two sets of changes are recommended in the Preamble to the Forest Service section of the Act, as follows:

(1) The first group of changes occur under the second proviso, which is amended to read as follows:

Provided further, That the appropriations for the work of the Forest Service shall be available for meeting the expenses of warehouse maintenance and the procurement, care, and handling of supplies, equipment, and materials stored therein for distribution to projects under the



supervision of the Forest Service and for sale and distribution to other Government activities and to State and private agencies who cooperate with the Forest Service in fire control under terms of written cooperative agreements, the cost of such supplies, equipment, and materials, including the cost of supervision, transportation, warehousing, and handling, to be reimbursed to appropriations current at the time additional supplies and materials are [produced] procured for warehouse stocks [from the appropriations chargeable with the cost of stock issued]:

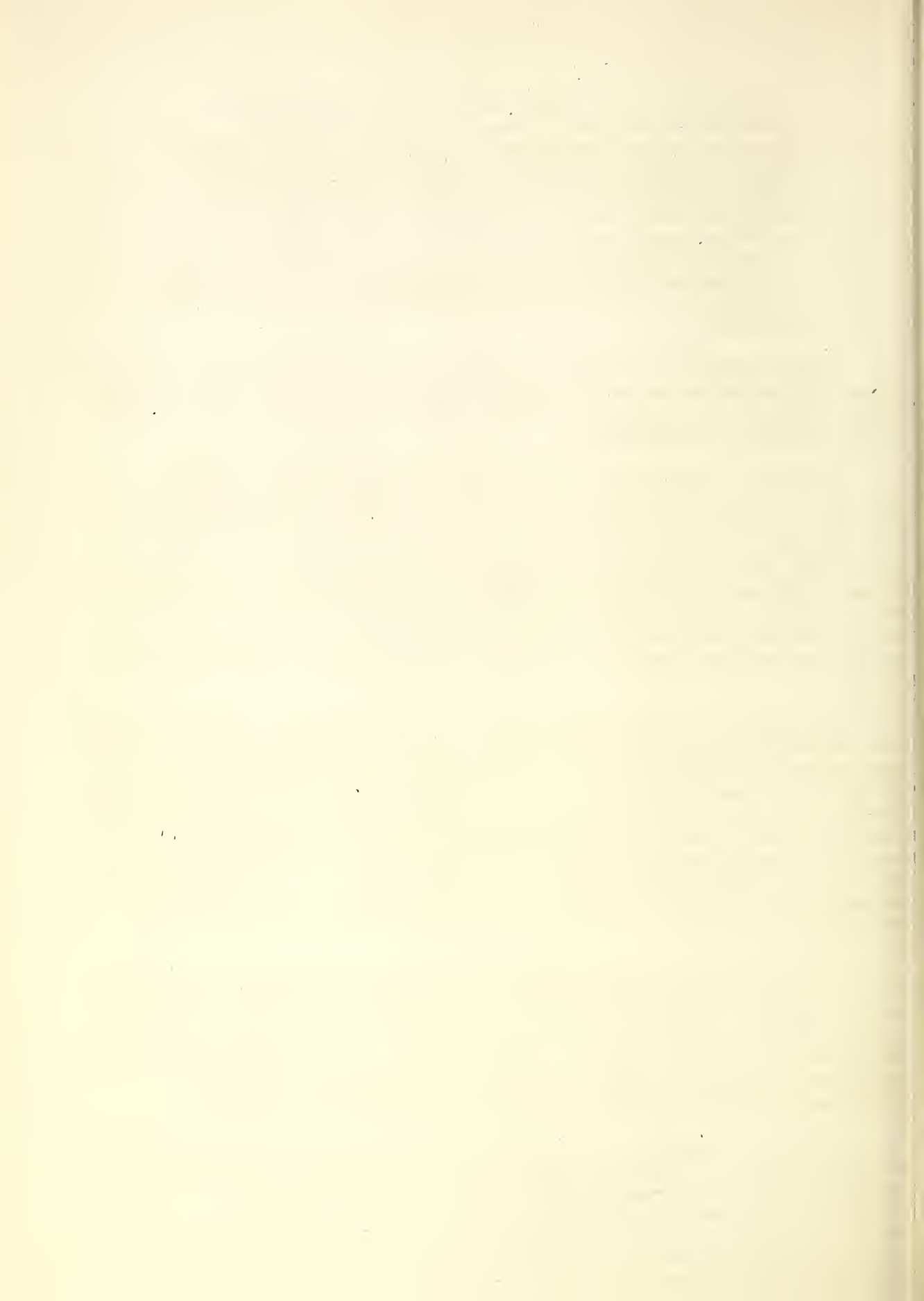
These changes will make it possible for the central warehouses of the Forest Service to supply to other fire-control agencies, on a reimbursement basis, fire-control equipment, supplies, and materials which are of special design, assembly, or packaging.

Section 1 of the Act of June 7, 1924 (43 Stat. 653), authorizes and directs the Secretary of Agriculture, in cooperation with appropriate State officials and other suitable agencies, to recommend such systems of forest fire control as will afford adequate protection. Section 2 of the Act recognizes the National interest in adequate protection of State and private forest lands and the responsibility of the Federal Government for a part of the protection costs. Under this authority it is a permanent policy to assist in the organization and development of protection work, to encourage cooperation between protective agencies, and to contribute directly to the costs.

In addition to Clarke-McNary Act activity there is another important association with States and private agencies in fire control. In the Northwestern States, because of the intimate geographical relationship of State and private forest lands to lands of the United States, fire control is not the function of any one agency but that of all three. Each maintains distinct protective forces, but each includes within its protective district boundaries forest lands belonging to the other two. This service is paid for by the agencies whose lands are benefited to the agency maintaining the protective force, with the whole definitely provided for in cooperative agreements.

The Forest Service has taken the lead in the development of forest fire control practice, particularly in the field of special firefighting tools, equipment, improvements, and other facilities. To fully redeem the responsibilities set up by the Clarke-McNary Act these developments must be passed on to the other agencies, and to insure adequate protection to Federal lands under contract to other agencies the facilities inaugurated and improved on the National Forests should be made available to them.

Specific examples of Forest Service developments are the Pulaski tool, the Hadley plow, the Bosworth lookout board and alidade, the Bosworth fire trencher, the R-1 emergency ration, and the R-1 boxed 30-, 45-, 60-, and 75-man-day unit rations. These developed fire control facilities, as well as many other items, are not manufactured in quantities for commercial distribution and are not assembled for quick dispatch. They are purchased or assembled only on the Forest Service specifications, usually directly from the



manufacturer. They are not available to the States and associations through usual commercial channels but may be purchased from Forest Service warehouse stock. Likewise, the ration units, assembled only by the Forest Service, are available from that source only. No single association or even State uses sufficiently large quantities of special fire control items either to develop its own supply organization or to contract with manufacturers and distributors. Consequently, unless Forest Service facilities are available by purchase to the protective agencies, they must use inferior substitutes which reflect in the performance of fire control on State, private, and Federal lands.

(2) The second change consists of a new proviso at the end of this paragraph reading as follows:

Provided further, That the Forest Service may rent equipment to other Federal agencies at rates sufficient to reimburse the appropriations of the Forest Service that would otherwise be chargeable with the cost of the repair, maintenance, and depreciation of such equipment

This change is recommended in order to provide a solid legal foundation for the continuation of a system of rental charges for use of equipment, specifically when equipment is rented to other agencies.

The extensive activities of the Forest Service in construction and maintenance of roads, trails, and miscellaneous improvements required for the development and administration of national-forest lands necessitate utilization of a considerable amount of motor-operated and other heavy equipment. Other Government agencies that do not maintain similar equipment frequently request loan of Forest Service equipment. Much of the heavy equipment depreciates rapidly in use and, in order to avoid depletion of Forest Service appropriations by service to the borrowing agencies, reimbursement to the Forest Service should include the value of depreciation. At the present time, however, inclusion of depreciation as a reimbursement item is not specifically authorized. To remove any doubt as to the propriety of including it in the reimbursement it is felt that specific authorization should be obtained in order that Forest Service appropriations may be utilized exclusively for the purposes for which provided.

(b) GENERAL ADMINISTRATIVE EXPENSES

	<u>Regular</u>	<u>Emergency</u>	<u>Total</u>
Appropriation, 1939.....	\$607,500	\$68,017	\$675,517
Budget Estimate, 1940.....	607,500	- -	607,500
Net change.....	<u>- -</u>	<u>-68,017</u>	<u>- 68,017</u>





## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)	Decrease
General administration and business service:				
Regular funds.....	\$606,900	\$607,500	\$607,500	- -
Emergency relief funds:	102,483	68,017	- -	-\$68,017
Total obligations...	709,383	675,517	607,500	- 68,017
Unobligated balance (regular funds).....	600	- -	- -	- -
Total (all funds)...	709,983	675,517	607,500	- 68,017

## WORK UNDER THIS APPROPRIATION

This appropriation is used for salaries and expenses of employees in the Washington office engaged on general administrative, facilitating, supervisory, and inspectional activities pertaining to the management of Forest Service work.

## (c) NATIONAL FOREST PROTECTION AND MANAGEMENT

	<u>Regular</u>	<u>Emergency</u>	<u>Total</u>
Appropriation, 1939.....	\$11,569,754	\$2,122,633	\$13,692,387
Budget Estimate, 1940.....	12,679,000	- -	12,679,000
Net change.....	<u>+1,109,246</u>	<u>-2,122,633</u>	<u>- 1,013,387</u>

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)	Increase or decrease
1. Timber use:				
Regular funds.....	\$1,177,451	\$1,279,000	\$1,279,000	- -
ER funds.....	34,100	17,800	- -	-\$17,800
Total.....	1,211,551	1,296,800	1,279,000	- 17,800
2. Forest fire prevention and preparedness:				
Regular funds.....	3,282,225	3,289,854	3,324,100	+ 34,246(1)
ER funds.....	120,100	57,900	- -	-57,900
Total.....	3,402,325	3,347,754	3,324,100	-23,654



Projects	1938	1939 (Estimated)	1940 (Estimated)	Increase or decrease
3. Forest fire suppression:				
Regular funds.....	\$202,366	\$202,500	\$202,500	- -
ER funds.....	21,700	10,600	- -	-\$10,600
Total.....	224,066	213,100	202,500	- 10,600
4. Protection against tree insects:				
Regular funds.....	122,572	122,700	122,700	- -
ER funds.....	145,973	70,664	- -	- 70,664
Total.....	268,545	193,364	122,700	- 70,664
5. Control of blister rust and other tree diseases:				
Regular funds.....	407,411	508,000	1,008,000	+500,000(2)
ER funds.....	344,328	165,751	- -	-165,751
Total.....	751,739	673,751	1,008,000	+334,249
6. Timber stand improvement:				
Regular funds.....	62,328	62,400	62,400	- -
ER funds.....	150,100	72,900	- -	-72,900
Total.....	212,428	135,300	62,400	-72,900
7. Reforestation and revege- tation of denuded areas:				
Regular funds.....	205,121	205,500	205,500	- -
ER funds.....	255,314	122,348	- -	-122,348
Total.....	460,435	327,848	205,500	-122,348
8. Nurseries and planting stock:				
Regular funds.....	252,852	253,000	253,000	- -
ER funds.....	50,400	24,000	- -	-24,000
Total.....	303,252	277,000	253,000	-24,000
9. Grazing use:				
Regular funds.....	1,116,027	1,117,500	1,192,500	+75,000(3)
ER funds.....	32,200	14,600	- -	-14,600
Total.....	1,148,227	1,132,100	1,192,500	+60,400
10. Recreation and land use:				
Regular funds.....	626,666	612,500	612,500	- -
ER funds.....	98,100	46,800	- -	-46,800
Total.....	724,766	659,300	612,500	-46,800



Projects	1938	1939 (Estimated)	1940 (Estimated)	Increase or decrease
11. Land classification, settlement, and claims:				
Regular funds.....	\$76,570	\$76,600	\$76,600	- -
ER funds.....	3,000	1,500	- -	-\$1,500
Total.....	79,570	78,100	76,600	- 1,500
12. Acquisition of land by direct purchase:				
Regular funds.....	133,200	133,400	133,400	- -
ER funds.....	71,000	34,000	- -	-34,000
Total.....	204,200	167,400	133,400	-34,000
13. Acquisition of land by exchange:				
Regular funds.....	107,593	107,700	107,700	- -
ER funds.....	3,000	1,500	- -	- 1,500
Total.....	110,593	109,200	107,700	- 1,500
14. Fish and game protection:				
Regular funds.....	427,375	428,000	428,000	- -
ER funds.....	65,800	31,900	- -	-31,900
Total.....	493,175	459,900	428,000	-31,900
15. Construction of truck and horse trails:				
Regular funds.....	382,683	383,500	383,500	- -
16. Maintenance of truck and horse trails:				
Regular funds.....	215,845	216,200	216,200	- -
17. Construction of improve- ments other than roads and trails:				
Regular funds.....	788,611	713,000	713,000	- -
ER funds.....	2,673,534	1,245,707	- -	-1,245,707
Total.....	3,462,145	1,958,707	713,000	-1,245,707
18. Maintenance of improve- ments other than roads and trails:				
Regular funds.....	1,478,860	1,481,000	1,481,000	- -
ER funds.....	336,100	162,000	- -	-162,000
Total.....	1,814,960	1,643,000	1,481,000	-162,000





Projects	1938	1939 (Estimated)	1940 (Estimated)	Increase or decrease
19. General surveys and maps:				
Regular funds.....	\$209,635	(a) \$210,000	\$210,000	- - -
ER funds.....	92,961	42,663	- -	-42,663
Total.....	302,596	252,663	210,000	-42,663
20. Cooperation with other departments, bureaus, and agencies:				
Regular funds.....	102,378	102,400	102,400	- -
21. Protection, administra- tion, and development of lands transferred from Farm Security Adminis- tration.....	- -	65,000	65,000	- -
22. Logging national-forest timber.....	- -	- -	500,000	+500,000(4)
Total obligations:				
Regular funds.....	11,377,769	11,569,754	12,679,000	+1,109,246(A)
ER funds.....	4,497,710	2,122,633	- -	-2,122,633
Total.....	15,875,479	13,692,387	12,679,000	-1,013,387
Transfer to "Rent of build- ings in the District of Columbia".....	15,000	- -	- -	- -
Transfer to "Salaries and expenses, Office of the Solicitor".....	14,400	- -	- -	- -
Unobligated balance (regular funds).....	18,781	- -	- -	- -
Total, Regular funds.....	11,425,950	(a) 11,569,754	12,679,000	+1,109,246
Total, ER funds.....	4,497,710	2,122,633	- -	-2,122,633
Total, All funds.....	15,923,660	13,692,387	12,679,000	-1,013,387

(a) Includes \$500 transferred to Bureau of Standards, Department of Commerce, for photographic research.



## INCREASES

(A) The increase of \$1,109,246 in regular funds for 1940 consists of:

(1) An increase of \$34,246 for forest fire prevention and preparedness. -- One of the weakest places in forest fire control is in the suppression of the relatively few fires which escape from the initial attack and attain unmanageable size. This increase is requested to permit an attempt to deal more effectively with such costly and destructive fires.

On stubborn fires of more than a few hundred acres it is necessary to assemble with the utmost haste from several hundred to several thousand men. On easier terrain and for short fights CCC crews do very well. On rougher ground or in heavier fuels the work is too arduous and too dangerous to permit CCC boys to be used in driving a fire line around the uncontrolled edge of the fire. Even carefully selected laborers recruited from labor centers produce pitifully small results in driving the line ahead. They are untrained and unorganized. They do unnecessary work on the line and require a degree of supervision which it is impossible to supply. Even husky men are nearly always unaccustomed to the climbing, heat, and gruelling exertion. They falter at the job; the completion of the fire line is delayed; the fire sweeps on; and still more men must be added to burden the facilities for transporting and feeding men.

It is the unanimous opinion of fire fighting experts that a properly selected crew of 40 men, organized for the whole fire season, would be more effective in driving a fire line around a fire of this type than 400 of the best men who can be assembled from labor centers. Such a 40-man crew would include only men of great physical prowess. They would be employed only on condition that they will not leave an uncompleted fire line to eat or sleep, thus saving the time and energy for the often long and exhausting hikes between the fire line and camps where food and bedding acceptable to ordinary laborers can be furnished. They would be fed with emergency foods carried to wherever they may be working. When a job continues until sleep and rest are necessary they would agree to sleep on the line. Being employed for the full fire season, they could be so fully trained that no man would do unnecessary work or neglect work that should be done. By regular hikes in rough country, with packs on their backs, they would be kept hardened and ready to work without excessive fatigue on stubborn fires which occur some time every year and continue to spread until excessive costs and losses are run up. Such crews cannot be organized by taking regular fire guards from lookout and other essential fire stations. To do so would be fatal. They can be supported in part, but only in part, by employing them on road and other construction work when there are no fires and when fire drills are not required.

The increase requested would also be used to supply the fast trucks needed to transport such men and their equipment to fires on which they are needed. With the aid of the amount requested one such crew can be organized and equipped for use on such costly and destructive fires as occurred last season in Oregon, Washington, and California.



(2) An increase of \$500,000 for control operations in the National Forests against blister rust and other tree diseases.--Rapid spread of the white-pine blister rust in western national forests necessitates this increase. This foreign disease is now so firmly established in the important forests of western Montana, northern Idaho, and eastern Washington that it is imperative that wild gooseberries and currants (*Ribes*) be eradicated immediately, in order to save established crops of western white pine and to avert a major economic disaster. Some young stands are now so badly infected that many of the trees are killed. Western white pine is a valuable timber species in this region. Continued production of this species, with resultant stabilization of the lumber industry dependent upon it and employing thousands of laborers, is impossible unless the disease is brought and kept under control.

The sugar pine region in the National Forests in northern California has been invaded by the disease, which is extending to the south. Sugar pine is extremely susceptible to blister rust. Unless the disease is checked, western white pine in the Inland Empire and sugar pine in the Sierras are doomed. This would be a worse catastrophe than was the elimination of the chestnut in the East by the chestnut blight. Control of blister rust is, however, entirely practicable, hinging on the eradication of *Ribes* plants, the alternate host of the disease.

Initial working is imperative on about half a million acres in the National Forests in the western white pine region and a million acres of national forest in the sugar pine region. Maintenance work (repeat treatments) is also essential on areas which have been given initial eradication, in order to destroy the relatively few *Ribes* which were missed and those which have grown since treatment.

Preservation of existing stands of white and sugar pines and continued growth of new stands are essential to protect present values and to guarantee future usefulness of national-forest lands suitable to the production of these valuable species. The livelihood of workers, communities, and industries is at stake. Protection methods developed by the Bureau of Entomology and Plant Quarantine are used and close cooperation is maintained with that Bureau. The job is a race against the spread of the disease.

Control work is comparatively well along in the National Forests in the Lake States, Northeastern, and Southern Appalachian regions, where the disease affects northern white pine. Efforts must be continued here to the fullest extent possible, but the far more serious situation affecting the two western National Forest regions mentioned above should have first consideration.

(3) An increase of \$75,000 for strengthening grazing use administration.--This increase is necessary to help take care of urgent present needs in range administration. There is an increasing demand from the stockmen who use the national forests and from conservation organizations for larger attention to the grazing resource and attendant activities. Many related factors, such as crop control, range conservation, flood and erosion





control programs, and the recent drouth cycle, have combined to focus public attention on the need for increased attention to proper soil management and its cover of vegetation. Within the national forests are the headwaters of the important watersheds of the United States. Grazing has an important influence on the protective cover of the watersheds and the rate of water discharge from them. The resource also extends and may continue to extend a large service to dependent livestock and agricultural pursuits, to insure which adequate ground management is necessary.

Eighty-eight million acres of national-forest lands are used for livestock grazing. More than 25,000 permittees, four and one-half million acres of crop-producing lands, and 22 million acres of grazing lands in private ownership, representing livestock and range investments of nearly \$200,000,000, are definitely related to and dependent upon the national-forest grazing resources of the Western States. Competition for the ranges has thus increased demands upon management. Trespass problems are greater, and there are enlarging claims from recreationists and game interests which should be met without undue social injustices and economic injuries to communities and individuals dependent upon a reasonable use of the forage crop, which, in addition to its large local and regional services, brings a substantial return to the public each year in grazing fees. For the fiscal year 1938 these revenues aggregated \$1,645,941.74.

(4) An increase of \$500,000 for logging national-forest timber.-- To increase employment of residents within and near national forests, to obtain better results in the woods, and to give longer term employment to the protective force now hired for only a few months each year, there is urgent need for the Forest Service to be able to do its own logging in carefully selected places instead of being dependent on finding people who will buy standing timber. The typical woodsman does not have the resources to finance even a small job in the woods, such as cutting fuelwood and holding it while it seasons. He must work for wages, paid currently. Often it is difficult to find anyone who will hire him to get out the rough products which are available on national-forest land, although there may be a ready market for those products delivered roadside or on a common carrier railroad.

The primary purpose of this requested increase in appropriation is to enable the Forest Service to finance such operations. They will be undertaken only where the sale of the products will return to the Treasury more than the possible sale price of the standing timber plus the cost of the logging; or, in other words, where the resulting increase in receipts will exceed the expenditures.

At present the Forest Service is in the position of a farmer who has to sell his crop standing in the field because he has no means of harvesting it. One result is that cutting cannot always be done when or with as much care for the future of the forest as would be desirable. European experience and such small experiments as have been made in this country demonstrate that better cultural and financial results are obtainable if the manager of the forest does the harvesting and sells the logs or other rough products roadside or delivered at other convenient points. Under





such a practice improvement of growing conditions for future crops can be more directly brought about.

The Forest Service hires considerable numbers of men for short periods as part of its fire control organization. When laid off, they hunt stable work and, if they find it, their training and experience are lost to the Service in following fire seasons. This project for logging national-forest timber will give opportunity to employ these short-term men beyond the short fire season; will give them jobs in which they can have the sense of security and stability that will keep them from becoming drifters or from becoming applicants for public relief.

The requested appropriation will enable a beginning to be made in meeting these needs. It is not the intent to displace logging in the national forests by private industry, but rather to supplement it where the public interest will be served by doing so. There have been cases in which certain standing timber could not be sold at any price, but, after it was cut and its actual condition could be seen, the products were eagerly sought by buyers. Money must be spent for labor and for simple equipment to take advantage of the social and silvicultural opportunities of such cases, as well as to obtain returns in excess of these expenditures. The appropriation requested will enable the Forest Service to start using those opportunities.

#### CHANGES IN LANGUAGE

Four changes are recommended in the language of this item, as follows:

(1) The first change eliminates the bracketed words from the clause which reads as follows:

"The maintenance and operation of aerial fire control by contract or otherwise [,including the purchase of one airplane]";

There is no intention on the part of the Forest Service to embark on an extensive airplane buying program. In fact, no airplanes whatever will be purchased if it can be avoided. However, situations are developing in the West which may make it necessary for the Forest Service to buy a few airplanes because privately owned planes cannot be obtained as needed to transport food supplies and equipment to men fighting fire in isolated sections of the national forests.

The Forest Service has been using airplanes for 20 years -- first in cooperation with the War Department, and since the fiscal year 1929 by contracting for this service with commercial flyers. The Forest Service is willing and anxious to continue the present contract arrangement but contractors are finding it difficult to continue in business because of the limited amount of airplane travel and transportation in the sparsely settled sections of the West. Recent developments in airplane design and construction are directed towards the manufacture of planes which are either too



large or too small to meet the needs of Forest Service transportation. For that reason the number of commercial flyers who own planes which are suitable for economical transportation on the national forests is being steadily reduced. Flying for the Forest Service is limited to the summer months and, unless contractors can supplement this business with other contracts, they cannot remain in business.

The Forest Service will continue to contract for airplane service, but, if it is impossible to get satisfactory contracts with commercial flyers, the bureau would like the privilege of purchasing airplanes as may be found necessary and employing qualified airplane pilots to operate them.

(2) The second change in language provides for the substitution of the words "experimental areas under administration of the Forest Service" for "experimental forests", so as to permit the expenditure of funds from this appropriation on experimental areas, mainly range lands, which are not provided for under the existing language. The areas of land in experimental ranges, upon which expenditures cannot be made under existing authority, are small and the amounts required for construction and maintenance of improvements will not constitute a heavy drain upon this appropriation.

(3) The third change recommended is the inclusion, immediately after the total of the appropriation, of the following clause:

"of which amount not to exceed \$25,000 shall be available for the purchase of land for administrative sites."

There are a great many small towns, especially in the West, where it is not possible to rent satisfactory office or warehouse space in commercial buildings for supervisors' headquarters. Many of the towns in which this situation exists are so small that the construction of Federal buildings will probably never be undertaken. In other cases suitable buildings cannot be provided at ranger station headquarters, which under present-day conditions require for each such station a dwelling, a garage, a small office building, and a small warehouse. In many of the towns in which ranger station headquarters are logically placed it is impossible to rent all these buildings under any conditions, and in other cases it is impossible to rent buildings which are located within a reasonable distance of each other. It should be understood, of course, that where no Government-owned dwellings are available the District Ranger must provide his own living quarters by rental or purchase. In too many cases it has been impossible to transfer men to certain locations because of the shortage of rentable dwellings.

(4) The fourth change is related to the recommendation for appropriation increase of \$500,000 for 1940 for "logging on national forests" and reads as follows:

"Provided further, That in sales of logs, ties, poles, posts, cordwood, pulpwood, and other forest products the amounts made available for schools and roads by the Act of May 23, 1908 (16 U.S.C. 500), and the Act of March 4, 1913 (16 U.S.C. 501), and the proportion of the gross proceeds therefrom payable to New Mexico and Arizona for their common-school fund pursuant to the Act of June 20, 1910 (36 Stat. 562, 573), shall be based upon the stumpage value of the timber."





At the present time the counties in which national forests are located receive 25 percent of national-forest receipts, which are derived from the rental of land and the sale of products "in place." If the Forest Service receives an appropriation increase for logging timber, products will be sold at prices in excess of the value of timber on the stump. This enhancement in value will be entirely due to the expenditure of appropriated funds by the Forest Service, and it is obvious that the counties should not participate in the distribution of the increased receipts resulting from the Government's logging operations.

#### WORK UNDER THIS APPROPRIATION

General. -- This appropriation covers all field activities relating to the administration, protection, and development of the national forests except the special appropriations for the construction and maintenance of roads and trails under the Federal Highway Act and the Act authorizing the expenditure of ten percent of national-forest receipts for this purpose; the acquisition of additional forest lands; emergency expenditures for fire suppression; and expenditures from funds deposited to the credit of the Forest Service by counties, States, associations, and individuals for fire prevention and suppression, brush disposal, construction and maintenance of improvements, and reforestation.

In August, 1938, the gross area of the national forests was 228,429,965 acres and the net area 175,825,082 acres. The control of this tremendous acreage imposes a distinct obligation upon the Federal Government to see that it contributes to the social, economic, and general welfare of the Nation. Public funds are necessary to manage these national forests, in addition to providing simple custodial functions, in order that the great economic resources inherent therein will provide real opportunities for a stable civilization. These public forests are so constituted as to be able to serve as reservoirs for employment and useful public works. They also represent one of the last basic resources whereto the Nation can look for increased opportunities for its people.

The specific projects cited below describe the work done under this appropriation. The majority of the personnel paid from this appropriation are assigned to ranger districts, national forests, and national-forest regions in the field where they participate to varying degrees in carrying forward the projects listed. Analyses of the existing work load demonstrated the actual need for these men in handling the management job on the national forests. In order to present a summary of the expenditures for the fiscal year 1939 in a more understandable form, there has been set forth below a table giving the cost per acre for the work projects under that appropriation:





National Forest Protection and ManagementCost per acre for work projects conducted under 1939 appropriation

<u>Name and title of project</u>	<u>Per acre costs based on gross area of 226,780,079 acres (excludes Resettle- ment Administration lands.)</u>	<u>Per acre costs based on net area of 174,739,403 acres (excludes Resettle- ment Administration lands.)</u>
1. Timber use.....	5.640 Mills	7.319 Mills
2. Forest fire preven- tion and preparedness	14.507 "	18.827 "
3. Forest fire sup- pression.....	.893 "	1.159 "
4. Protection against tree insects.....	.541 "	.702 "
5. Control of blister rust and other tree diseases.....	2.240 "	2.907 "
6. Timber-stand im- provement.....	.275 "	.357 "
7. Reforestation and revegetation of de- nuded areas.....	.906 "	1.176 "
8. Nurseries and planting stock.....	1.116 "	1.448 "
9. Grazing use.....	4.928 "	6.395 "
10. Recreation and land use.....	2.701 "	3.505 "
11. Land classification, settlement, and claims	.338 "	.438 "
12. Acquisition of land by direct purchase...	.588 "	.763 "
13. Acquisition of land by exchange.....	.475 "	.616 "
14. Fish and game.....	1.887 "	2.449 "
15. Construction of truck and horse trails	1.691 "	2.195 "



National Forest Protection and ManagementCost per acre statement - Continued.

<u>Name and title of project</u>	<u>Per acre costs based on gross area of 226,780,079 acres (excludes Resettle- ment Administration lands.)</u>	<u>Per acre costs based on net area of 174,739,403 acres (excludes Resettle- ment Administration lands.)</u>
16. Maintenance of truck and horse trails.....	.953 Mills	1.237 Mills
17. Construction of im- provements other than roads and trails.....	3.144 "	4.080 "
18. Maintenance of im- provements other than roads and trails.....	6.531 "	8.475 "
19. General surveys and maps.....	.924 "	1.199 "
20. Cooperation with other departments, bureaus and agencies.	<u>.451 "</u>	<u>.590 "</u>
Total per acre costs for all projects and areas listed above.	50.729 "	65.837 "
21. Protection, admin- istration, and develop- ment of lands to be transferred from Re- settlement Administra- tion (1,649,886 acres gross, 1,085,679 acres net).....	<u>39.397 "</u>	<u>59.870 "</u>
Total per acre costs for all projects based on gross area of 228,429,965 acres and net area of 175,825,082 acres...	50.647 "	65.800 "

1. Timber Use. -- The Act of June 4, 1897, provides for the sale of timber from the national forests and, in addition, requires that a "continuous supply" be provided for. Thus sales are authorized on the sustained yield basis, with the forest treated as a renewing crop. In order to do this definite knowledge of the volume, species, and condition of the stands is necessary.



disposal must be planned carefully so as to keep the forest growing more timber, and sales must be capably administered. Also the specific timber offered for sale is appraised by competent men to obtain a fair value for the Government's property.

Cruising, the preparation of long-time plans for sustained yield operations, the determination of and marking of trees that are to be cut, the appraisal of timber offered, and the enforcement of the conditions of the contract of sale, including the determination of the volume cut and consequently of the amount to be paid, are all necessary for the accomplishment of the job as outlined in the law governing sales of national-forest timber.

In addition to timber that is sold for commercial purposes, dead timber is also furnished free in limited amounts to bona fide settlers, miners, residents, and prospectors for minerals and for firewood, fencing, building, mining prospecting, and domestic purposes. Green timber is furnished free where the cutting will benefit the timber stand. In addition, sales at cost of administration, under special legal provision, are made to homestead settlers and farmers for material needed for the farm.

A summary of the Forest Service timber use business over the past six years follows:

#### National Forest Timber and Special Products Business

F.Y.	Amt. Timber Cut, Sales, Settlement, Trespass, and Land Exchange	Receipts from Sales, Settlement, Trespass and Special Products	Value of National Forest timber cut under land exchange
1933	473,922,000 ft. B.M.	\$ 782,808	\$238,868
1934	674,542,000 " "	1,522,356	212,546
1935	752,368,000 " "	1,731,355	217,112
1936	1,021,156,000 " "	2,203,237	470,585
1937	1,290,623,000 " "	2,924,471	448,603
1938	1,287,917,000 " "	2,517,658	549,035

Volume of timber on national forests (estimated), 552,000,000,000 board feet. Maximum allowable annual cut under sustained yield principles (estimated), 8,000,000,000 board feet.

#### Number of Special Products Sales and Commercial Sales Made on the National Forests

F. Y.	<u>Number of Commercial Sales</u>		Number of Special Products Sales
	Less than \$500 in Value	Over \$500 in Value	
1933	14,294	68	--
1934	16,304	129	--
1935	17,380	140	1,312
1936	18,211	178	863
1937	18,873	263	1,213
1938	20,440	311	1,165





2. Forest Fire Prevention and Preparedness. -- The present system of organized forest fire control dates back to 1910 when the disastrous fires of that year brought about recognition of the size of the problem. The activities under this project are of such importance and general application that practically every employee paid from this appropriation contributes to it in some degree.

Under this project fire prevention is an activity of primary importance. Sustained educational campaigns, locally and on a national scale, are carried on through the employment of all available media -- news items, magazines, house organs, radio programs, motion pictures, lectures, admonitory signs, exhibits, distribution of pamphlets and other literature, and by constant personal contact with the resident and visiting public. In this educational work all possible support is enlisted from national and local agencies organized in civic, welfare, patriotic, and trade fields.

Other activities in fire prevention include: requiring visitors to equip themselves with fire-fighting tools; partial or entire closing of areas to public travel during dangerous periods; "fireproofing" camp grounds; concentration of campers on public camp grounds; at times prohibiting smoking and camping at other than established camp grounds; registering and cautioning tourists; clearing road rights-of-way; and apprehending and prosecuting persons responsible for starting fires.

Controlling forest fires is largely a task of advance systemized preparation. Practically all the members of the permanent organization are available for fire control work. In addition, approximately 4,000 men designated "guards" are employed during the fire season and are stationed at strategic points throughout the forests where they act as lookouts, "smoke chasers," or patrolmen. The lookouts are stationed at points which overlook large areas of forest land. These men are connected by telephone to ranger district headquarters. They watch for fires and notify district rangers or dispatchers of the location of the fires. Smoke chasers are stationed on roads or trails and are also connected by telephone with headquarters, and when fires are reported the smoke chasers are dispatched to the fire. Patrolmen both detect and suppress fires within reach of their patrol routes.

In advance of the opening of the fire season complete plans are prepared, including maps showing areas visible from lookout stations, transportation and communication systems, areas of greatest fire hazard, etc. Fire-weather forecasting and rating systems are set up. Organization charts are prepared showing the location of all available man power, including permanent and temporary employees, road and other construction men, settlers and ranchers, sawmill and logging camp operators, etc. Such charts also include information concerning tools, equipment, and food supplies which may be needed if large crews are required for suppressing fires. Cooperative agreements are entered into with individuals and with all agencies in the vicinity of the national forest which may be of assistance in controlling forest fires. Men are selected and systematically trained at pre-season training camps whenever possible, and detailed written instructions are prepared for each member of the force.

3. Forest Fire Suppression. -- Fire is an ever-present danger in some portion of the forested area of the country. The great size of the forests in





comparison with the relatively small patrolling force, the inaccessibility of wilderness areas, the dry air, light rainfall, the prevalence of lightning in the mountains, and the constant use of fire in the daily life of the people and in industries combine greatly to increase the hazard.

Complete fire exclusion in a forest is rarely attainable because fires originate from natural as well as human causes. The established protection policy calls for fast, energetic, and thorough suppression of all fires in all locations during possibly dangerous fire weather. The objective demands such planning and execution of attack as will secure control within the first work period or before 10 o'clock of the next morning.

Upon receipt of the report of a fire the regular organization functions immediately and men are dispatched to the scene. Though each fire-suppression job is an individual problem, there are certain basic principles of attack. The first requirement is usually to learn the size of the fire and determine its probable progress by noting topography, type of cover, wind conditions, dryness of litter, natural firebreaks, etc. Next comes the job of building the fire line where the best judgment of the officers in charge dictates. The line is patrolled to prevent the fire from jumping it. During the construction of the control line and after it has been completed and the fire checked continual patrol is necessary to prevent it from breaking out again, jumping the line, and going on a rampage. No fire is left until it is completely out.

4. Protection Against Tree Insects. -- Tree insects are always present in the forest. Natural enemies normally keep down the numbers of injurious species so that damage is not excessive. Sudden epidemic increases occur in populations of barkbeetles and other destructive forms, requiring artificial control measures. Close cooperation between the Forest Service and the Bureau of Entomology and Plant Quarantine insures planning and execution of necessary control measures.

Methods used are to locate, map, and treat areas where infestations are building up to epidemic proportions. The effort is to confine attacks to relatively small areas, reduce the numbers of insects, and return the infestation to an endemic stage. Vast quantities of overripe timber on the national forests are particularly susceptible to insect damage, necessitating adequate control of epidemics.

Control measures vary with the type of insect, its life cycle, and character of the terrain. Chief costs are for the employment and subsistence of labor. Barkbeetles -- most destructive of the forest insects -- are controlled by destroying the immature broods while in the trees by felling and burning infested trees; by felling the trees and peeling and burning the bark; or by spraying standing trees with oil and scorching the bark. Defoliators are controlled by applying poison sprays to the trees. Crews of temporary laborers work under the supervision of permanent forest officers.

5. Control of Blister Rust and Other Tree Diseases. -- Tree diseases are practically always present in the forest. Native diseases are responsible for extensive timber losses, but the most serious disease threats to the national forests have been due to the introduction and spread of foreign diseases. White-pine blister rust is at present the outstanding disease threat in the national forests.



Control of this scourge may be accomplished by the use of measures developed by the Bureau of Entomology and Plant Quarantine. Technical advice is obtained also from the Bureau of Plant Industry. Very close cooperative relationships exist between the Forest Service and these Bureaus. Technical direction of blister rust control on national forest land is supplied by the Bureau of Entomology and Plant Quarantine; and the Forest Service handles the control operations. On other lands both phases are directed by the Bureau of Entomology and Plant Quarantine. Eminently satisfactory progress has been made by the two bureaus in keeping their programs properly balanced with respect to control work on national forest and intermingled private lands.

Forest diseases may be controlled by vigorous attack in the early stages of infection to prevent epidemics. In the case of blister rust the problem is simplified because the disease is of the dual host type. Spores from pine trees do not reinfest pine but must pass through a stage on the leaves of *Ribes* (currants and gooseberries), where other spores develop, which are borne by the wind to nearby pines. Control is accomplished by removing the *Ribes* in and near pine stands. Most of the work is done by pulling the bushes by hand, although in some cases chemical control, by spraying, is possible. Dense thickets sometimes are eliminated by tractors with bulldozer attachments. Laborers must be housed in camps in much of the territory where control is necessary.

6. Timber-Stand Improvement. -- Timber-stand improvement represents a type of work highly essential if intensive forest management is to be practiced on our national-forest properties. Its object is to improve the conditions for growth in our various types of stands. Timber-stand improvement is accomplished through practices known as cleaning, thinning, and sanitation cutting, the object being to favor the thrifty specimens of the better species by releasing the selected crop trees from crown and root competition. This work is performed by carefully trained organized crews, properly equipped, proceeding through the woods in line formation, each man selecting his crop tree and releasing it from competition.

At the present time charges to this activity represent largely general and direct supervision of work performed by crews paid from emergency funds.

7. Reforestation and Revegetation of Denuded Areas. -- Four and a half million acres of national forest land need planting. The first national-forest planting was done in 1902 and there are now 669,874 acres of satisfactory plantations.

The following table shows the areas planted and sown on the national forests in recent years:

<u>Calendar year</u>	<u>Acres</u>
1932.....	24,755
1933.....	69,215
1934.....	74,716
1935.....	140,724
1936.....	223,075
1937.....	156,427





Forest fires, destructive logging, and exhaustive agricultural use (of submarginal land) are responsible for the denudation of the areas which must be planted to restore productivity. In western national forests much of the denuded land was burned before the forest reserves were created; some has burned since that time. In the Lake States, Northeast, and South millions of acres have been purchased for national forests, including much land -- potentially highly productive -- which has been devastated by destructive logging and repeated fires. Smaller areas of these national forests are in critical condition because of former misguided agricultural use.

Reforestation is done to improve watershed conditions, particularly on areas which supply water for municipal and domestic use; to control and prevent erosion; and to grow commercial crops of timber, which will provide, or increase, future opportunities for labor in connection with the harvesting of the forest products produced.

Planting is a seasonal job and provides work for comparatively large numbers of laborers during the spring and fall seasons when weather conditions are favorable for the work. It is done by trained crews working under the direction of forest officers.

Planting areas are selected carefully and the trees -- grown in Forest Service nurseries -- are planted in rows, spaced from 4 to 8 feet apart, depending on species of tree, condition of the planting site, object of planting, etc. Funds from this appropriation are used for field planting only where it is impracticable to do the work with CCC or other emergency labor.

During recent years great emphasis has been placed on two phases of planting work. Methods of planting have been refined and much greater care is used in planting each tree. Thorough training technique has been developed and used in order to make the work of the temporary laborers more effective. In some cases refined methods have resulted in lower production per man day. Higher ultimate survival offsets the slight increase in initial cost.

8. Nurseries and Planting Stock. -- Nursery specialists, assisted by crews of temporary laborers, operate the nurseries in which seedling and transplant trees are produced for national forest planting. Trees from one to four or five years of age are required, age class and size depending on species of tree and condition of the planting site. Twenty-six nurseries are now operated at a total planned annual production of approximately 172 million trees. Many of the nurseries could grow more trees; total possible production of existing nurseries being 270 million trees.

Nurseries vary in size, depending on annual production and the age class of trees grown. Transplant stock requires much greater space than is needed for producing seedlings. Each nursery is equipped with a water system for spraying the growing trees, nursery office, workshops, and implement houses. Many have a residence for the nurseryman, planting-stock storehouse, and seed extractory buildings. Temporary laborers are employed during the growing and shipping seasons. Nursery work includes extracting, cleaning, and storing tree seed; preparing, sowing, weeding, and watering seedbeds; transplanting; watering, cultivating, and weeding transplants; lifting, grading, and packing trees for field planting; and maintaining soil fertility by means of fertilizers and soiling crops.





The following statement lists the names of the Forest Service nurseries, the State in which located, and the approved annual output of seedlings and transplants of each nursery:

List of Forest Service nurseries producing forest tree seedlings and transplants primarily for planting national-forest land

Name	State	Approved annual output*
Savenac.....	Montana.....	10,000,000
Bessey.....	Nebraska.....	6,000,000
Monument.....	Colorado.....	5,500,000
Pole Mountain.....	Wyoming.....	280,000
LeRoux Springs.....	Arizona.....	500,000
McCall.....	Idaho.....	1,000,000
Tony Grove.....	Utah.....	1,000,000
Durbin.....	California.....	1,500,000
Wind River.....	Washington.....	3,500,000
Parsons.....	West Virginia.....	5,000,000
W. W. Ashe.....	Mississippi.....	25,000,000
Ozark.....	Arkansas.....	2,900,000
R. Y. Stuart.....	Louisiana.....	26,000,000
Enoree.....	South Carolina.....	700,000
Beal.....	Michigan.....	7,500,000
Butternut.....	Wisconsin.....	2,600,000
Lydick.....	Minnesota.....	9,200,000
Chittenden.....	Michigan.....	14,600,000
Eveleth.....	Minnesota.....	5,300,000
Hayward.....	Wisconsin.....	4,600,000
Hugo Sauer.....	Wisconsin.....	8,250,000
Knife River.....	Minnesota.....	50,000
Licking.....	Missouri.....	1,600,000
James W. Tuomey.....	Michigan.....	12,600,000
Vallonia.....	Indiana.....	2,200,000
Wyman.....	Michigan.....	14,500,000
All nurseries.....		171,880,000

\* Based on need for planting in the national forests served by each nursery and on available funds. Many nurseries could produce more stock.

9. Grazing Use. -- Work carried on under this activity is both administrative and technical. Administrative activities have to do with the co-ordination of domestic livestock forage uses with wildlife, recreation, timber production and protection, and other uses of the national forests. All livestock grazed are covered by formal permit excepting the few head permitted free to settlers, miners, and prospectors and those used in connection with permitted operations. The latter permits sometimes involve relatively more work than the larger, more formal transactions and sometimes require written permits. Some 12,000,000 pay and free stock, which include the season's natural increase, were grazed in 1937.



Other work consists of the handling of grazing applications for pay permits; stock counting; inspections to determine range readiness and to see that management on different units of range is installed and carried out during the grazing season; studies of those uses in relation to local capacities; supervision of improvement construction such as fences, water development, stock bridges, driveways, and stock trails; poison-plant eradication; handling of complaints and appeals; meetings with stockmen and advisory boards; preparation of annual and periodic reports; and the development and current revision of unit management plans. New trespass cases during 1937 numbered 271; over 5,940,000 acres were covered by intensive range surveys; poisonous plants were dug on 2,529 acres; 8 new livestock associations were perfected, bringing the number to 743; and assistance was given on more than 700,000 acres for rodent control.

10. Recreation and Land Use. -- The work carried on under this activity includes the planning, control, and administration of all forms of occupancy of national forest lands except only those relating to the use of the forage and timber resources. General surveys of entire national forests are made in order to determine and classify areas suited to each specific use. Because of conflicting demands of various types of uses, careful surveys and planning for each are necessary. The areas that are classified as being suited to recreational use require further surveys and plans in order to determine the specific type of recreational use to which they are best adapted. Careful planning is necessary because the designation of areas as special-use areas, suited for resorts, summer homes, clubs, etc., or for public campgrounds, or for primitive areas, constitutes in many instances a permanent dedication to that use.

The work involved in administering the special-use business of the Forest Service includes negotiations with prospective permittees, showing them the available sites, issuing permits, the drawing up of minimum requirements, plans, and specifications for each special-use area; review and approval of improvement plans of new permittees, according to the area in which the use is located; making up permits, preparation of letters of transmittal for handling the fees, and inspection of areas for compliance with clauses made a part of the contract or special-use permit.

Particularly in Regions 7, 8, and 9 the forest tenancy problem is acute and involves thousands of desperately impoverished families. These people were tenants on the land before it was purchased and it would be a serious matter to remove them -- the more so because their removal would serve to complicate the social and relief problems in adjacent areas. The problem is to rehabilitate them to the extent that they can make a living on the land supplemented by work on the forest. The first consideration is to make their homes weatherproof and their water supply sanitary. Then, in order to protect the land, farm plans are prepared and compliance checked. Erosion control of tilled lands is secured through terracing and proper crop rotation.

A great deal of study is necessary to revise forest work plans so as to provide as much forest employment as possible for these people. Work provided to these occupants must be integrated with other emergency work programs.





On each special-use area it is necessary to survey out each lot, locate each road and service drive, and set stakes on each lot for building locations. On the public-use areas it is necessary to plan the entrance drives, camping areas, campground facilities, parking areas, playgrounds, beaches, etc.

Within each specific area it is necessary to determine whether the entire area shall be dedicated to special use and become available for summer homes, clubs, or resorts, or a combination of two or more of these uses, or whether the entire area shall be dedicated to public use and developed as a public campground, or whether it shall be kept primitive. It might be finally decided that a specific area should be developed so that a portion would serve as a campground, another portion as a summer hotel or resort site, still another portion as sites for summer homes. All these decisions must be based upon surveys and plans.

On public campgrounds, used free of charge by the public, policing is required to assure proper use and maximum utility by the public. On a majority of the public campgrounds this duty is assigned to a regular or temporary seasonal employee of the Forest Service in conjunction with his other duties. On the larger campgrounds it is necessary to assign men as caretakers for the entire camping season. On many of these areas policing, garbage-disposal provisions, and furnishing firewood requires the services of more than one man.

Additional work carried on under this activity includes the landscaping of ranger stations and other administrative buildings, checking forest road locations prior to construction with particular regard for the preservation of scenic and recreational values, and checking designs of all structures erected in the national forests from the viewpoint that their appearance will be appropriate in a forest setting.

11. Land Classification, Settlement, and Claims. -- The lands reserved for national forest purposes from the public domain are subject to the provisions of the Forest Homestead Act of June 11, 1906, and the Classification Act of August 10, 1912. These Acts require the determination, classification, and listing of all lands chiefly valuable for agricultural purposes and not needed for more important public purposes. The original work of classification was completed a number of years ago, but need for revision, amendments, and readjustments arises intermittently and requires administrative action. Lands listed and entered under these laws require periodic supervision, and, preliminary to application for patent, reports must be made for the Department of the Interior. The national forest lands reserved from the public domain also are subject to the general mining laws of the United States and to the public-land laws relating to rights-of-way, easements, etc., in which cases the Forest Service acts as the field representative of the Department of the Interior, preparing the necessary reports and conducting the required supervision of the development work. There are tens of thousands of mining locations within the national forests and scores of applications for easements, rights-of-way, etc., which require attention each year.





The principal purposes of this activity are to insure (a) that the lands chiefly valuable for agricultural purposes are properly classified and made available for entry, (b) that all the requirements of the public-land laws are satisfactorily met, and (c) that use and occupancy under such public-land laws do not result in illegal or unjustified conflict with the protection and use of the national forest lands and the public interests inherent therein. The activity entails the use of the time of personnel on the work of field examination, the determination of fact, the preparation of reports, the presentation of evidence in cases of violation of legal limitations, and administrative routine in relation thereto. Proper control of mineral locations requires in itself the permanent employment of two technically qualified mineral examiners in addition to the part-time service of numerous forest rangers and other members of the field organization.

12. Acquisition of Land by Direct Purchase. -- This project includes only the time and expenses of employees paid from this appropriation while engaged on this activity, generally in a supervisory capacity. The acquisition of land by direct purchase has been financed each year since 1911 by a special appropriation or an allotment from emergency funds. In the Agricultural Appropriation Act for 1939, the amount appropriated for this purpose was \$3,000,000. A description of this activity will be found under the caption "Acquisition of Lands for National Forests".

13. Acquisition of Land by Exchange. -- Within the national forests of the United States there are an estimated 25,000,000 acres of land not vested in Federal ownership, consisting of grants to States and to railroads, various types of entry, and lands patented under the general land laws of the United States and the Forest Homestead Act of June 11, 1906. These lands, being widely interspersed among the Federal lands within the forests, complicate and increase cost of protection of the national forest properties and in many cases not only retard the proper management and utilization of the Government's holdings but constitute fire hazards for adjoining national forest lands. There are also many other forest lands outside the established national forest boundaries but contiguous thereto which are integral parts of the same natural unit of forest management in which the public interest can be promoted by bringing such lands under Federal management and protection. In recognition of this condition Congress has passed a total of 72 laws permitting the acquisition of privately owned forest lands in those contiguous areas by granting in exchange not to exceed an equal value of national forest land or stumpage within the same State.

The acquisition of forest land by the exchange medium serves the multiple purpose of bringing natural units of forest management under approved plans or programs of management and use; eliminating or minimizing conditions of abnormal risk or hazard on private lands which might ultimately result in serious damage to contiguous Federal holdings; establishing unified areas of national forest lands which can be administered with a minimum cost; providing for optimum development of the resources of the area; and promoting the conservation of the natural productivity and esthetic and social values of such lands, making it possible to apply their benefits to the general welfare of the communities within and adjacent to national forests. The acquisition of land by the exchange medium also frequently makes it possible for the Government to cooperate with owners of large scattered tracts to consolidate their



lands, thereby permitting them to establish more unified areas, with resultant benefits of better management and use of their lands. The exchange project has been very beneficial to the Government in consolidating its lands when appropriations for land by direct purchase are not sufficiently large to meet the needs of the Government in acquiring very desirable key tracts in certain areas.

The conduct of this activity involves the receipt of applications for exchange; the examination, mapping, cruising, and appraisal of the offered land to determine the maximum values which may be allowed therefore; the comparable examination, mapping, cruising, and appraisal, where necessary, of the Government lands to be selected in exchange, or of terms of exchange with the owners of the private land; the preparation of the necessary reports for review by the various executive officers and by the Secretaries of Agriculture and the Interior or their staffs; and the subsequent transaction of the successive routine steps necessary to consummate the exchanges and deliver the national-forest lands or stumpage. During the fiscal year 1938 there were submitted to the Secretary of Agriculture, for approval and transmittal to the Secretary of the Interior, a total of 151 cases involving an aggregate of 200,877 acres of private land, valued at \$832,970; selected areas containing 14,454 acres and valued at \$66,498; and selected national-forest stumpage valued at \$595,353. Initiation and consummation of these exchanges required or will require the performance of all of the above cited functions.

To date the lands acquired through exchange by the United States have supported about twice as much stumpage of merchantable character as has been granted for such lands in the form of stumpage. The stumpage acquired will in time become salable and yield receipt to the Treasury. To acquire such private lands and stumpage it is necessary to grant more accessible national-forest stumpage, some of it within the limits of going timber sales. While the stumpage so granted would otherwise be salable for cash, some of it would not normally be salable for a considerable future period, because the parties to the exchange are the only ones that could use such stumpage in the future, and they would not be willing to acquire it by cash purchase, although they are willing to acquire it by exchange.

14. Fish and Game. -- Work under this head consists of cooperation with various Federal, State, sportsmen, and other agencies; cooperation in the enforcement of State and Federal game laws; examination of licenses and their issuance in remote places where the public cannot be otherwise effectively served; the giving of information to the public about game laws and wildlife; the requisition and planting of large numbers of fish and the development of fish planting plans; posting game refuges and other protected areas; transplanting beaver; assistance in transplanting game birds and in predatory-animal control; the making of game estimates and the collection of statistical information on species and on game animals killed by man and by predators; the relation in season to game laws and bag limits; inspection and selection of sites for holding and rearing ponds; development of plans for restocking of lakes and streams; supervision of lake construction and stream improvements; game bird surveys, with special observations on species threatened with extermination; winter observations on range adequacy for big game and condition of animals; studies of sex ratios; forage requirements; assistance in emergency feeding during critical periods; study and correlation of wildlife and domestic stock uses, over-populations, public hunts, and the development of game management plans.





15. Construction of Truck and Horse Trails. -- Most of the national forests are located in sparsely settled sections of the country and were largely undeveloped and inaccessible when acquired. The major costs of the work on truck and horse trails are borne under the appropriations "Roads and Trails for States, National Forest Fund" and "Forest Roads and Trails". The work under this specific project includes the time and expenses of the employees paid from the appropriation "National Forest Protection and Management" and is concerned with the planning and supervision of the construction work, payment of accounts, maintenance of records, purchase of supplies and equipment, and similar service activities. The special road appropriations provide for the direct cost of labor, materials, supplies, and direct supervision.

16. Maintenance of Truck and Horse Trails. -- The direct costs of maintenance are borne by the Forest Road and Trails appropriations. However, a great deal of time is necessarily spent by the regular personnel in planning, coordinating this project with other activities, supervising the work, paying accounts, hiring personnel, purchasing supplies, and in similar service functions. The scheduling of this work is very important, inasmuch as all roads must be opened in advance of the fire season.

17. Construction of Improvements Other Than Roads and Trails. -- Most of the national forests are located in the mountainous regions of the country, largely undeveloped and inaccessible. To facilitate their administration and protection it is necessary to equip them with various classes of improvements.

Telephone lines are needed for fire control in localities where commercial systems are not available, lookout cabins on mountain peaks to house men, and instruments properly located to discover lightning and other fires and to transmit the alarm; lookout towers where the topography does not provide a natural elevation sharp enough to command the necessary view; dwellings, barns, and other structures necessary to provide quarters for men and animals who must be stationed remote from any settlement or rentable quarters; simple office structures for housing records and transacting business required in administrative or fire-control work; fences to prevent the trespass of unpermitted stock or to control the drift of permitted stock in order to secure the best utilization of the national-forest ranges; water improvements in the form of developed springs and wells, pipe lines, and other works required at ranger and other stations, or for watering livestock on the forest ranges, or for public campgrounds; and other campground improvements designed to protect the forests, maintain sanitary conditions, and facilitate public recreational enjoyment of the forests by providing simple structures, etc.

There are also required certain improvements of a nonstructural nature, such as permanent firebreaks and lanes placed in strategic locations to facilitate holding fires that escape from the initial efforts to control them; the clearing of debris and fallen timber along roadsides to reduce the fire hazard; the improvement and cleaning of fishing streams; and soil-erosion work.

Each national-forest region has a plan for its improvement needs. As funds are made available, those of highest priority are constructed along standardized specifications and simple practical lines.





18. Maintenance of Improvements Other Than Roads and Trails. -- This project includes the repair and maintenance of all forms of improvements except roads and trails. The thousands of miles of telephone lines are thoroughly gone over; fallen trees are removed; broken wires are spliced; insulators are replaced, and instruments are checked. The wear and tear on buildings and lookout towers in forested country is great. Lightning insulation is repaired, windows are replaced, and guying, painting, roofing, etc., are attended to. Fences are put in shape by post replacement, guying, and wire repair. Springs, troughs, tanks, basins, and piping are cleaned and repaired. Public campgrounds are cleaned up and put in shape and fire preventive safeguards are freshly overhauled.

19. General Surveys and Maps. -- A greater and more intensive utilization of the forests, the addition of new forest areas, or changes in boundaries of forests for purchase units require markings of property lines, surveys and maps for laying out transportation, detection and communication systems, special-use and recreation areas, nurseries, administrative stations, lookout towers, water-resource utilization, type mapping, and property ownership. Corrections of existing maps must be secured to make these suitable for Forest Service administration and protection. Some 80 forest maps must be corrected, traced, lithographed, and printed. More accurate locations of topographic features are required for the proper protection and administration of the forests. The Forest Service is not engaged in general quadrangle mapping like that of Geological Survey, in township and sectional surveys like the work of the General Land Office, or upon control surveys similar to those of the Coast and Geodetic Survey. However, where any topographic, cadastral, or control work is done the standards used permit adoption and incorporation with the later work of the other agencies.

20. Cooperation with other Departments, Bureaus, and Agencies. -- The Forest Service cooperates with other Government departments, bureaus, and agencies on activities not primarily of benefit or producing benefits to national-forest resources. Often the Forest Service is better qualified to carry on such work because of the technical experience of its personnel or because the geographic distribution of its organizations may enable it to better handle the work from the broad viewpoint of Government economy. This work is done in accordance with the standards established for the various jobs. Illustrative of this work project is the cooperation with the Bureau of the Census in their agricultural and lumber censuses; cooperation with the National Park Service, the Bureau of Indian Affairs, and the War Department regarding forestry problems on their lands; cooperation with the Department of Justice and the Treasury Department in law enforcement where national-forest lands are involved, etc.

21. Protection, Administration, and Development of Lands Transferred from Farm Security Administration. -- This is a special temporary work project utilized to permit the presentation of the need for additional funds under a single heading. When these lands are placed under administration, the activities or work projects applicable to them will be identical with those for all other lands under the national-forest system, although in the first few years of administration great emphasis will be placed upon such activities as the establishment of an effective fire-control organization; the maintenance of improvements now existing on the area; the preparation of plans for additional



improvements needed for fire control, grazing use, water conservation, recreation, and administration; the survey of existing resources; and the preparation of management plans for water, timber, forage, recreation, wildlife, and special uses.

All these areas adjoin or are reasonably close to existing national forests. In no case will it be necessary to establish additional Forest Supervisors' offices for their administration. However, many of the areas are so large as to require the establishment of additional ranger districts, together with fire guards, other temporary labor, supplies, material, equipment, etc.

22. Logging National Forest Timber. -- Unemployed experienced woods labor will be employed if this increased appropriation is obtained. Reasonably steady employment throughout the year or the logging season is contemplated. Supplemental employment also can be given to fire guards and other short-term men now employed by the Forest Service only a few months a year on seasonal work.

Logging of national forest timber will be done on areas in need of cutting for silvicultural reasons, such as the salvage of insect-infested or over-mature timber; thinning of young stands; and removal of merchantable remnants of a former stand to release young timber. Logs, cordwood, and other forest products will be cut, skidded to the roadside, piled, and offered for sale. Sale procedure will be similar to that now used in disposing of national forest timber on the stump. Most sales will be by competitive bids, as at present, but unit prices will be higher, representing both stumpage and labor values.

Crews of experienced woodsmen will be employed to do the logging after the timber to be cut has been selected and marked. All phases of the work will be planned and supervised by permanent technically trained Forest Service personnel. Logging tools and equipment will be furnished by the Forest Service. Particularly in the East and South it will be desirable and practicable to hire men and teams for skidding logs.

Relatively small jobs will be undertaken. Sawlogs, cordwood, and other forest products produced under this project will supplement, rather than displace, the products produced under regular timber sales procedure.

#### (d) RECONSTRUCTION AND REPAIR OF ROADS AND OTHER IMPROVEMENTS, NATIONAL FORESTS IN CALIFORNIA

An appropriation of \$1,000,000 was provided by the Second Deficiency Appropriation Act, fiscal year 1938 (approved June 25, 1938), for the reconstruction or repair of roads and for other improvements on the national forests of California damaged or destroyed by floods. The appropriation was made available for the fiscal year 1938, to remain available until September 30, 1938.



## PROJECT STATEMENT

Project	1938	1939 (Estimated)	1940 (Estimated)
Reconstruction and repair of roads and other improvements, national forests in California .....	- -	(a)\$1,000,000	- -

(a) A 1938 appropriation to be obligated in 1939.

## WORK UNDER THIS APPROPRIATION

The exceptionally heavy rains during the months of December, 1937, and March, 1938, caused damages to improvements of the Forest Service throughout the State of California running into the millions of dollars. With the 1938 fire season rapidly approaching it was essential to reconstruct roads, trails, and telephone lines to facilitate the transportation of fire guards, equipment, and fire fighters and for communication between key points on the national forests. Other classes of improvements included reconstruction or relocation of damaged camp grounds to avoid serious congestion and unsanitary conditions on undamaged camp grounds, as well as abnormal fire hazard due to camping in areas which have not been properly fireproofed. Repairs of dams and weirs were also necessary to preserve the integrity of the studies in forest influences which are being conducted by the California Forest and Range Experiment Station.

## (e) WATER RIGHTS

Appropriation, 1939 .....	\$20,000
Budget Estimate, 1940 .....	<u>20,000</u>

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
Investigation and establishment of water rights .....	\$10,000	\$20,000	\$20,000







## WORK UNDER THIS APPROPRIATION

For administrative and recreational areas, stock watering, and similar uses, the Forest Service needs the right to appropriate and use water. While the amount for an individual diversion or storage is usually small, the number of such uses is very great. Through utilizing appropriations already made, the necessary water right has been secured for a portion of the most urgent cases particularly those in the Colorado River drainage where suit instituted by Arizona may result in the permanent adjudication and decree of all the water in that drainage and deprive the United States of water rights vitally indispensable to the proper administration and utilization of the national forests.

The \$20,000 appropriation provided by this item is used for a determination of the location and amount of existing utilizations, the making of engineering surveys, the preparation of applications to the proper State authorities, payment of filing fees, securing permits, and for the purchase of existing water rights, decrees, or land. Several more years will be required before existing uses of water, particularly in the Colorado River drainage, are adequately protected.

## (f) FIGHTING FOREST FIRES

Appropriation, 1939.....\$100,000  
 Budget Estimate, 1940 ..... 100,000

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
1. Fire suppression.....	\$1,208,667	\$67,000	\$67,000
2. Protection of lands, railroad forfeiture units.....	77,729	- - -	- - -
3. Protection of unappropriated public forest lands.....	75,595	53,000	35,000
Unobligated balance.....	17,428	- - -	- - -
Total appropriation.....	(a) 1,379,417	(b) 100,000	100,000

(a) Includes \$1,279,417 forest-fire deficiency provided by Deficiency Appropriation Act, 1938.

(b) Regular appropriation; does not include 1939 fire-fighting deficiency.

## WORK UNDER THIS APPROPRIATION

1. Fire Suppression. -- This project covers emergency fire-control expenditures in connection with the suppression of forest fires on the national forests. Administrative restrictions placed upon the use of these funds by the Forest Service provide that expenditures shall not be made therefrom until forest



fires have actually started. An exception is made to this rule, however, when fire conditions become so critical that the regular protective organization, which is financed from the appropriation "National Forest Protection and Management," is unable to cope with the situation and when, therefore, the temporary employment of additional guards clearly will reduce expenditures for fire fighting.

Expenditures are made for the employment of fire fighters and their transportation and for equipment needed on going fires when not available in stocks of equipment previously purchased. Expenditures are made for the travel expenses of forest guards when going to or returning from fires and for the travel expenses of regular employees of the Forest Service when the travel extends beyond the boundaries of the units to which they are regularly assigned or when the activities to which men are regularly assigned do not include fire fighting.

2. Protection of Lands, Railroad Forfeiture Suits. -- This project was taken over by the Department of the Interior on July 1, 1938.

3. Protection of Unappropriated Public Forest Lands. -- Unappropriated public forest lands are widely scattered throughout the entire West. In many cases protective associations, organized to protect privately owned lands, were compelled, prior to fiscal year 1938, to protect the public forest lands intermingled with the private lands. Under cooperative arrangements which have been worked out between the Forest Service and the timber protective associations, the Federal Government will now bear its fair share of the cost of protecting these public lands. The accounts of the timber protective associations will be audited by the Forest Service and the per-acre cost of protecting the public forest land will be based upon a total figure from which all improvement and development expenses have been eliminated.

In addition to the lands within the boundaries of timber protective associations, there are large areas of unappropriated public forest lands which should be protected from fire. None of the lands outside timber protective association boundaries are being protected at the present time, but studies are under way, and there is a probability that fire-control programs will be initiated on those areas where protection can be given at reasonable costs.

#### (g) PRIVATE FORESTRY COOPERATION

Appropriation Act, 1939.....	\$100,000
Budget Estimate, 1940.....	125,000
Increase.....	<u>25,000</u>

#### PROJECT STATEMENT

Project	:	1938	:	1939	:	1940	:	Increase
	:		:	(Estimated)	:	(Estimated)	:	
Cooperation with timberland owners	:	- -	:	\$100,000	:	\$125,000	:	+ \$25,000 (1)



## INCREASE

(1) The recommended increase of \$25,000 under this item will provide for the expansion of the program for cooperation with private timberland owners. -- The care and conservation of the Nation's timber resource cannot stop at public forest boundaries. Four-fifths of the forest lands in this country are in private ownership. A portion consists of farm woodlands; the remainder includes commercial and industrial holdings, which constitute the primary source of supply for lumber and woods products. The public welfare makes it mandatory that this land and resource be wisely used. Regardless of ownership it is of paramount importance that the technical facilities, knowledge, and assistance of the Forest Service be made available for the efficient and long-time management of forest lands.

Forest lands in private ownership, especially commercial and industrial holdings, have in the past, in general, been handled with little thought of the future. Carelessness and waste have been the rule rather than the exception. Fires, racing through large forest holdings, have taken their toll of human life and inflicted staggering economic losses. Cut-over lands, resultant from hasty and indiscriminate logging, especially on large logging operations, have been abandoned to become an alarming liability to local governments already overburdened with economic distress.

Today but a vestige remains of our original timber stands. With a rapidly growing demand for wood cellulose for almost innumerable new products, with communities, investments, employment, and the very well-being of thousands of our citizens at stake, an awakened interest on the part of operators, land owners, and the general public in applying forestry principles to the management of forest land is evident. More than one million workers are directly dependent upon wood-using industries -- their very existence is related to the stability and permanence of those industries, such as lumber and pulp industries, which must secure raw material primarily from privately owned forest lands of non-farm classification. These forest holdings must be managed to guarantee an uninterrupted supply of that raw material. Careless and improper management jeopardizes that supply. However, because of the lack of information and knowledge on the subject and because of the public interest involved, the Federal Government, through the Forest Service, has a responsibility which can no longer be avoided.

The public in the past has given little attention to the handling of privately owned commercial forest land, and the public stake has been given only minor and ineffective consideration. Prior to July 1, 1938, governmental assistance or appropriations have not been available for cooperative work on commercial and industrial forest holdings, except for limited fire protection. Perpetuation and wise use of the forest resource is in part public responsibility. The solution lies in the adoption of forestry principles by private owners for timber production. The Forest Service is the acknowledged leader in such work, and private industry, State agencies, and private timberland owners expect the Service to cooperate and assist in the promulgation and application of proper management plans on commercially valuable forest lands, together with the procurement of the data upon which such plans are necessarily based. The results of many years of technical analysis and intensive study available in the Forest Service are of inestimable value to private owners of commercial and industrial timberlands, and cooperation in their adjustment and application is of primary importance in







building up sound management of the country's forest resources. Individual States are recognizing the need of legislation designed to protect, conserve, and efficiently utilize the forest resource lying within their boundaries and look to the Forest Service for guidance and advice in the formulation of long-range plans and methods of legislative action.

The increased appropriation is desired to permit much-needed and essential expansion in the cooperation and assistance which is furnished under this project and which carries a definite public asset in the stabilization of an essential industry and the continuance of employment opportunities.

The importance of proper management of commercial forest land was adequately expressed by the President in his message of March 14, 1938, to the Congress. The inadequacy of present measures was deplored and definite expression given of the responsibilities and obligations of the public with respect to the commercial timber holdings.

#### WORK UNDER THIS APPROPRIATION

Work performed under this item embodies the securing of improved forestry practices on privately owned commercial and industrial forest lands for eventual application of sustained-production and sustained-yield management to widespread areas, providing economic and social stability for forest communities and industries, leading to the conservation and proper use of the forest resource and the perpetuation of the supply of raw materials essential to the continuance of important industries. Problems inherent in the management of private holdings of forest land are analyzed to determine where, how, and to what extent private forestry can be practiced. Working relations are established with forest-producing agencies as a basis for working out, first of all, the most critical problems in the various important forest regions. The invaluable information and technical knowledge gained by the Forest Service through years of intensive analysis and study are made available for use in the management of privately owned forest lands of commercial and industrial importance.

The problems are attacked on a broad front by various means, including (1) studies of individual private and joint private-public ownerships to determine the best practicable methods and plans of forest management; (2) cooperation with organized groups of forest industries; (3) analysis of factors affecting success or failure of private forestry; (4) extensive surveys of the forest situation in political units; and (5) exploration of State and Federal legislation bearing on private forestry.

#### Forest Research

##### (h) FOREST MANAGEMENT INVESTIGATIONS

	<u>Regular</u>	<u>Emergency</u>	<u>Total</u>
Appropriation, 1939....	\$648,403	\$132,976	\$781,379
Budget Estimate, 1940..	648,403	- -	648,403
Net change.....	<u>- -</u>	<u>-132,976</u>	<u>-132,976</u>



## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)	Decrease
1. Silvicultural investigations:				
Regular funds.....	\$296,248	\$298,179	\$298,179	- -
Emergency relief funds.....	148,203	98,755	- -	-\$98,755
Total.....	444,451	396,934	298,179	-98,755
2. Mensuration:				
Regular funds.....	40,732	49,080	49,080	- -
Emergency relief funds.....	2,350	1,566	- -	-1,566
Total.....	43,082	50,646	49,080	-1,566
3. Forest regeneration:				
Regular funds.....	84,891	85,575	85,575	- -
Emergency relief funds.....	9,579	6,383	- -	-6,383
Total.....	94,470	91,958	85,575	-6,383
4. Fire protection:				
Regular funds.....	117,854	117,950	117,950	- -
Emergency relief funds.....	6,392	4,259	- -	-4,259
Total.....	124,246	122,209	117,950	-4,259
5. Naval stores:				
Regular funds.....	23,058	17,314	17,314	- -
Emergency relief funds.....	4,826	3,216	- -	-3,216
Total.....	27,884	20,530	17,314	-3,216
6. Forest genetics:				
Regular funds.....	74,935	80,305	80,305	- -
Emergency relief funds.....	28,209	18,797	- -	-18,797
Total.....	103,144	99,102	80,305	-18,797
Total obligations:				
Regular funds.....	637,718	648,403	648,403	- -
Emergency relief funds.....	199,559	132,976	- -	-132,976
Total.....	837,277	781,379	648,403	-132,976
Unobligated balance (regular funds).	685	- -	- -	- -
Total (all funds):				
Regular funds.....	638,403	648,403	648,403	- -
Emergency relief funds.....	199,559	132,976	- -	-132,976
Total.....	837,962	781,379	648,403	-132,976



## WORK UNDER THIS APPROPRIATION

General. -- The research carried under this appropriation is concerned with the problems of establishing and growing forest crops on forest land, regardless of ownership, and of protecting them from fire. Investigations are under way in all the important regions in the United States except in the Great Plains, Alaska, and the island possessions. In each region where research is carried on emphasis is placed upon the most pressing and urgent problems. These investigations are basic to the successful practice of forestry.

Forest-management investigations supply the facts on which sound forestry practices are based. Specifically, they aim to provide the information needed by Federal, State, and private agencies and individuals to enable them to reforest, protect from fire, and manage forest land to the best advantage, to insure an adequate future supply of lumber and other forest products, to increase the quality and quantity of forest products, and to maintain forest cover where needed for recreation and the protection of watersheds and wildlife. They have developed methods, which are being applied on a national scale by the CCC, in stand improvement, reforestation, hazard reduction, and fire control. They have disclosed many of the fundamental principles bearing on the location of lookouts, firebreaks, and roads and trails being constructed on the national forests and the national parks. They have supplied data on reforestation and naval-stores practices to the Agricultural Adjustment Administration and have furnished information on growth, forest management, and forest protection to the States and to various other public and private agencies. These investigations furnish information essential to the management and protection of the national forests. The work is specifically covered by Section 2 of the Act of May 22, 1928 (McSweeney-McNary Forest Research Act), which authorizes and directs the Secretary of Agriculture to conduct fire, silvicultural, and other forest investigations and experiments and to establish and maintain certain designated forest experiment stations for that purpose. The work is being carried out under the following projects:

1. Silvicultural investigations. -- This project furnishes basic information necessary to manage forest lands and to grow forest trees as a crop. Because of the great diversity of growing conditions, over 50 major forest types and 180 commercially important forest-tree species have to be dealt with. Diversity of ownership and interests further complicate the problems of forest-land management. Prior to the establishment of the Forest Service little was known about the habits, requirements, and possibilities of American forest-tree species and types, and the information available today is far from complete. Specifically, silvicultural investigations aim to determine the distribution, habits, requirements, and ecological relations of the more important forest-tree species and types and the best management of commercially important forest types to insure perpetuation of the more desirable features, maximum forest production, sustained yield, and high-quality forest products. Such information is essential to the proper management of the national forests and is urgently needed by State and private forest landowners if forest cover is to be maintained, watersheds protected, and the country's future needs for forest products supplied. This work is now carried on by 12 regional forest experiment stations.







2. Mensuration investigations. -- The object of this project is to determine the rate of growth of trees and stands. It includes, for each of the commercially important forest-tree species, the preparation of "volume tables" showing the average contents of trees of different dimensions and conditions in terms of cubic feet, board feet, cords, and other units; "growth tables" showing the average relation of height, diameter, and volume to age; and, for each of the commercially important forest types, "yield tables" showing the characteristics of the stand at different ages and the yield to be expected under various conditions and methods of handling. There are about 180 forest-tree species and 50 or more forest types of commercial importance in the United States about which such information is needed. In addition, it is necessary to standardize the form and substance of such tables and the technique of their preparation and application, to explore the fundamental laws of form and growth, and to adapt and apply statistical methods to the solution of other forestry problems. Work is under way on this project at Washington, D. C., and at 10 regional forest experiment stations.

3. Forest regeneration investigations. -- This work involves the further development of methods of reforesting denuded or poorly stocked forest land. It is estimated that there are 83,000,000 acres of such land in need of planting. Accordingly, it is necessary to determine for each of a large variety of conditions the species and methods of regeneration to be employed; the best method and season of direct seeding, where direct seeding is possible; the size and class of planting stock to be used, where planting is necessary; the details of nursery practice and the technique of field planting; and ways and means by which natural regeneration can be induced or stimulated. This involves examination of past plantings to determine the causes of success or failure, studies of seed production and dissemination, and studies of nursery methods and planting technique. Work of this sort is now in progress at 10 regional forest experiment stations.

4. Fire protection investigations. -- Work in this field deals with the effects of forest fires and with ways and means for their prevention and control. Specifically, studies are being made of fire prevention procedures; of equipment for and methods of detecting and suppressing fires; of the relation of weather, topography, and fuel to the occurrence and behavior of forest fires; of the forecasting of high hazard periods; and of the effects of fire, including loss through growth retardation, premortality, and other damage, as well as uses of fire for silvicultural and other forest measurement purposes. Work of this sort is now under way at eight regional forest experiment stations.

5. Naval stores investigations. -- The naval-stores industry has long been important in the South. Early methods of turpentine were crude and inefficient and resulted in the waste of much valuable timber. The object of these investigations is to further improve the technique of turpentine production and the equipment used; to determine the effect of tree size, weather conditions, and surface fires on yield; to study the effect of various methods of turpentine on tree growth and timber quality; and to work out the best means of combining turpentine and timber production. Investigations are now under way at the Southern Forest Experiment Station.



6. Forest genetics investigations. -- The segregation of production of desirable strains by breeding, a procedure which has proved invaluable with crop plants, is practically unexplored with respect to forest trees. Work under this project is aimed at the production of trees of higher rates of growth, more resistant to diseases and insects, of better form, and capable of producing higher quality forest products. This involves the study and segregation of geographical strains and races, studies of the technique of natural and artificial cross pollination and fertilization, experiments in hybridization, investigations of the genetical constitution and transmission of desirable characteristics, field trials of promising individuals and strains, and similar studies. The work is conducted at the California and the Northeastern Forest Experiment Stations.

## (i) RANGE INVESTIGATIONS

	Regular	Emergency	Total
Appropriation, 1939..	\$225,935	\$28,053	\$253,988
Budget Estimate, 1940	225,935	- -	225,935
Net change.....	- -	-28,053	-28,053

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)	Decrease
1. Grazing management investigations:				
Regular funds.....	\$170,472	\$170,717	\$170,717	- -
Emergency relief funds.....	25,193	16,787	- -	-\$16,787
Total.....	195,665	187,504	170,717	-16,787
2. Artificial reseeding:				
Regular funds.....	39,151	39,218	39,218	- -
Emergency relief funds.....	2,095	1,396	- -	-1,396
Total.....	41,246	40,614	39,218	-1,396
3. Range forage:				
Regular funds.....	15,977	16,000	16,000	- -
Emergency relief funds.....	14,812	9,870	- -	-9,870
Total.....	30,789	25,870	16,000	-9,870
Total Obligations:				
Regular funds.....	225,600	225,935	225,935	- -
Emergency relief funds.....	42,100	28,053	- -	-28,053
Total.....	267,700	253,988	225,935	-28,053
Unobligated balance (regular funds)	335	- -	- -	- -
Total (all funds):				
Regular funds.....	225,935	225,935	225,935	- -
Emergency relief funds.....	42,100	28,053	- -	-28,053
Total.....	268,035	253,988	225,935	-28,053





## WORK UNDER THIS APPROPRIATION

General. -- Proper range-management practices are necessary for the conservation of the range resources and to assure the stability and economic welfare of the livestock industry dependent upon these lands. The work under this appropriation consists of investigations to develop better methods of management of forest and other ranges. It is furnishing basic technical information necessary for the administration of the range resource in the national forests and on other ranges, public and private. It is also formulating the methods necessary for range improvement, revegetation for flood control and other range-land phases of the work of the CCC and related projects. The studies of range management to offset destructive drought losses have aided immeasurably in relief and land-use adjustments. The 900 million acres of forest and untimbered range land represent nearly half the land area of the United States. Forage productivity of the great western range has been decreased over 50 percent through overgrazing and drought. These investigations alone can supply the information required as a basis for restoring and maintaining the productivity of these lands.

Range research is being carried on under the authorization contained in Section 7 of the Act of May 22, 1928 (McSweeney-McNary Forest Research Act), which provides for experiments and investigations under the direction of the Secretary of Agriculture to develop improved methods of management, consistent with the growing of timber and the protection of watersheds, of forest ranges and of other ranges adjacent to the national forests, at forest or range experiment stations or elsewhere. The projects include:

1. Grazing management investigations. -- This work consists of investigations to develop methods for managing range lands that will assure the stability and perpetuation of range resources, including forage, watershed, timber reproduction, and other range-land values. It involves determination of the grazing capacity of various range types and of ways and means of restoring and maintaining the better forage plants, improving methods of handling livestock on ranges, controlling losses from poisonous plants, reducing the fire hazard by grazing, and harmonizing grazing with other range-land values.

The studies involve high summer ranges, mainly on national forests, foothill spring-fall ranges, desert winter ranges, and semidesert year-long ranges. These studies have aided greatly in the better coordination for profitable use of these important parts of the year-long livestock operation, and they promise additional results urgently needed by the livestock industry and by the Federal and State governments in their plans for permanent land use and development. This work is now conducted at the six regional forest and range experiment stations in the West.

2. Artificial reseeding investigations. -- This work includes investigations to develop methods of restoring artificially the plant cover on seriously depleted ranges and abandoned dry farms. Studies are under way to determine what native species justify selection for improvement, the possibilities for adapting native and introduced species for seeding or transplanting, and how they can be most economically reproduced and established





on range lands. These studies promise results of vital importance to the range livestock industry and to Federal and State agencies in planning sound land use on a permanent basis. The work is being conducted mainly by the Intermountain and the Northern Rocky Mountain Forest and Range Experiment Stations.

3. Range forage investigations. -- Work under this project includes the collection and analysis of information on the identity, distribution, and the forage and watershed protective and other values of over 12,000 plant species which inhabit forest and other ranges--information absolutely essential to good range management. It includes the building up of the most complete annotated working herbarium of range plants in the country, a basic feature in meeting the demands for information incident to these studies. This is a continuing study. Range plants and data are collected by all the administrative and research personnel of the Forest Service concerned with range management. The major compilation and analyses are made in Washington.

(j) FOREST PRODUCTS INVESTIGATIONS

	Regular	Emergency	Total
Appropriation, 1939.....	\$628,361	\$36,747	\$665,108
Budget Estimate, 1940.....	700,000	- -	700,000
Net change.....	<u>71,639</u>	<u>-36,747</u>	<u>34,892</u>

PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)	Increase or decrease
1. Timber harvesting:				
Regular funds.....	\$97,382	\$94,000	\$94,000	- -
Emergency relief funds.....	6,119	4,077	- -	-\$4,077
Total.....	103,501	98,077	94,000	-4,077
2. Forest products statistics:				
Regular funds.....	9,998	10,000	10,000	- -
Emergency relief funds.....	- -	- -	- -	- -
Total.....	9,998	10,000	10,000	- -
3. Pulp and paper:				
Regular funds.....	113,030	114,000	114,000	- -
Emergency relief funds.....	10,455	6,967	- -	-6,967
Total.....	123,485	120,967	114,000	-6,967
4. Strength of wood:				
Regular funds.....	123,058	123,361	150,000	+ 26,639(1)
Emergency relief funds.....	11,083	7,385	- -	-7,385
Total.....	134,141	130,746	150,000	+19,254



Projects	1938	1939 (Estimated)	1940 (Estimated)	Increase or decrease
5. Seasoning and physical properties:				
Regular funds.....	\$88,397	\$89,000	\$99,000	+ \$10,000(2)
Emergency relief funds.....	6,402	4,266	- -	-4,266
Total.....	94,799	93,266	99,000	+ 5,734
6. Chemical composition:				
Regular funds.....	64,526	65,000	70,000	+ 5,000(3)
Emergency relief funds.....	2,983	1,988	- -	-1,988
Total.....	67,509	66,988	70,000	+ 3,012
7. Wood preservation:				
Regular funds.....	82,927	84,000	114,000	+ 30,000(4)
Emergency relief funds.....	10,700	7,130	- -	-7,130
Total.....	93,627	91,130	114,000	+ 22,870
8. Wood structure:				
Regular funds.....	48,940	49,000	49,000	- -
Emergency relief funds.....	7,405	4,934	- -	-4,934
Total.....	56,345	53,934	49,000	-4,934
Total obligations:				
Regular funds.....	628,258	628,361	700,000	+71,639
Emergency relief funds.....	55,147	36,747	- -	-36,747
Total.....	683,405	665,108	700,000	+34,892
Unobligated balance (regular funds)	103	- -	- -	- -
Total (all funds):				
Regular funds.....	628,361	628,361	700,000	+71,639(A)
Emergency relief funds.....	55,147	36,747	- -	-36,747
Total.....	683,508	665,108	700,000	+34,892

## INCREASES

(A) An increase of \$71,639 in regular funds for 1940 is recommended to provide for a building and construction research program, including low-cost housing, the objectives of which are as follows:

Building and Construction Research Program

To most individuals the purchase of a home represents the largest investment of a lifetime, and not always is there sufficient margin of income to take care of excessive maintenance charges. How should he have built in the



first place to have avoided these excessive costs and inadequate comfort and service? This is one question which this study seeks to answer. By far too much of present practices in construction are designed for profit to the builder rather than for economy to the home owner. This research is designed to meet these everyday problems of the home owner as well as the more general problems in wood construction.

Agencies of Government concerned with housing and construction are constantly seeking information regarding the proper use of wood and generally feel that the potential development of construction employing wood products will be seriously retarded unless greater impetus is given to research seeking new and improved methods of wood design and fabrication. In line with this expressed need the proposed study includes research into new structural possibilities, such as laminated rafters and beams, wood trusses, and other structural assemblies suggested by the new, improved technics in glues and joint details. Contemplated also is the appraisal of the utility and applicability of wood in new and modified forms, such as plywood and synthetic resin-impregnated plywood. It is proposed to develop a standard base around which that part of city building codes relating to the use of wood can be prepared or revised.

The largest single item of home maintenance is painting; in fact, about 85 percent of the paint used for houses is for repainting. These paint coatings should be made to last longer. Another large item having had no research is floor finishes and finishes of trim and furniture.

Of the annual fire loss of around one-half billion dollars and 10,000 lives, perhaps one-half occurs in wood frame construction. Significant saving of life and property can be accomplished through research that will decrease the fire hazard of wood in buildings.

Standard preservatives are not always applicable nor is commercially treated lumber readily available for the vulnerable parts of the house that are often attacked by decay which causes serious damage and increases maintenance costs. Simple methods must be worked out, new cheap preservatives developed, and the effectiveness of new preservatives that come on the market investigated.

Modernism in home design, construction, and equipment, such as air-conditioning designed to raise the standard of living and comfort, bring with them new moisture problems which must be solved.

In brief, it is to insure structural strength and stability in wood construction, low maintenance costs, and a maximum of service and comfort that this research is undertaken.

The increase of \$71,639 under this item would be distributed by projects as follows:

(1) An increase of \$26,639 for studies in strength of wood, which are undertaken (a) to improve traditional practice in the use of wood for building and construction and to develop new structural systems to the end that





wood structures may have the greatest strength and stiffness per unit of cost and material; (b) to study the properties of wood and plywood and methods of improving its use as a construction and building material, in order to develop more efficient use and increased serviceability; and (c) to develop a building code relating to the use of wood in dwellings and other buildings of wood frame construction.

(2) An increase of \$10,000 for moisture studies to develop ways and means of preventing damage to houses and other structures resulting directly from the use of high inside humidities and indirectly from the use of modern forms of building construction. These studies will include research and development of work on various present and prospective types of building walls and surveys of the moisture content of wood in buildings both with and without air-conditioning.

(3) An increase of \$5,000 for chemical studies to develop treatments of wood that will reduce shrinkage and swelling.

(4) An increase of \$30,000 for wood preservation investigations for (a) testing and comparing wood preservatives and treating methods and obtaining records of their performance; (b) comparing and developing methods of finishing and maintaining wood floors and other interior woodwork; developing improvements in the painting of houses; (c) developing and testing fire-resistant coatings and treatments for wood and increasing the fire safety of wood structures by improvements in design; (d) developing better methods of cutting veneer for plywood manufacture, through the use of lower quality and smaller logs, proper log treatment, and improved cutting technique; studies of glues and gluing processes in relation to quality; study of wood durability as related to moisture, fire, decay, insects, checking, and warping; and determination of protection methods to assure satisfactory service under widely different conditions of use.

#### WORK UNDER THIS APPROPRIATION

General. -- The growing of timber for the many products demanded by modern civilization represents the more tangible economic value or use of forest land. A broad and intelligent utilization of our forest resources is therefore an indispensable feature of an adequate national forestry program. The utility value of wood must be maintained and increased. The foundation of efficient utilization is research in forest products.

The better adaptation of wood to modern consumption requirements is a matter of direct concern to consumers, whose proper housing and standards of living are bound up with the satisfactory use of wood products; to workmen, who need the hundreds of millions of dollars in wages furnished by employment in the woods, the sawmills, the pulp mills, and broadly diversified fields of wood construction and manufacture; to farmers and other timberland owners, large and small, seeking market outlets for materials from their vast aggregate acreage of woodlands; to local communities, counties, States, and the Nation, which have a vital interest in stable revenues from forests,



forest lands, and successful forest industries. In our national forests alone the investment in land and timber and the responsibility for a wise utilization of the products require a broad program of research looking to the broadening and stabilization of markets for forest products.

The bulk of the work in forest-products research is centered at the Forest Products Laboratory at Madison, Wisconsin, with some associated work at forest experiment stations and at Washington, D. C. Since its establishment in 1910 the Laboratory has become the outstanding institution of its kind in the world. Conservative estimates place the annual savings to users and producers, through application of Laboratory findings alone, at a figure at least 100 times the cost of operation. Only a small part of the needed work in forest products has been done. There can be no question of the vital part that forest-products investigations play in the whole forestry program.

The work is done at the Forest Products Laboratory or elsewhere under the authorizations for forest products investigations of domestic woods and of tropical woods specified by Section 8 of the Act of May 22, 1928 (McSweeney-McNary Forest Research Act), which authorizes and directs the Secretary of Agriculture to conduct experiments, investigations, and tests with respect to the physical and chemical properties and the utilization and preservation of wood and other forest products, including tests of wood and other fibrous material for pulp and paper making, and such other experiments, investigations, and tests as may be desirable. The work is conducted under the following projects:

1. Timber harvesting and conversion investigations. -- This work includes costs and returns in logging and milling trees and logs of different sizes; design of logging machinery; selection and grading of lumber; and wood-use development.

Millions of acres of barren cut-over land in the South, the East, the Lake States, and of late in the West are the result of the general belief among timber operators that maximum returns necessitated felling all trees of the desirable species that would cut out any lumber. The owner of forest land is now learning that practically his only chance of low-cost and high-yield continuous production is to evaluate returns on the basis of analytical data, such as the Forest Service has recently been making available, which dictate removal of the larger trees and leaving the smaller trees for growing stock.

Under prevailing practice the timber left, or that which has restocked the cut-over areas, has consisted largely of species less valuable than those removed. To find new uses for these species, based on their best utility values, is a major forestry problem and a feature of this project. Its solution will enable their profitable removal and at the same time improve the forest. Coupled with this is the problem of converting the present 50 percent waste in the woods and at the mill into marketable commodities.

Lumber is separated at the mill into classes or grades on a basis of the number, condition, and size of visible defects. Rules for grading have become more and more complicated, with resultant difficulties and misunderstanding between manufacturers and users. The Forest Products Laboratory





has played a prominent part in various movements to improve and simplify grading rules. Federal specifications prepared by the Forest Service govern the purchase of lumber by the Government.

2. Forest products statistics. -- Information as to the production, consumption, and distribution of lumber and other forest products is essential to the orderly manufacture and marketing of forest products; the maintenance and proper distribution of adequate and suitable supplies of raw material for wood users; and as a basis for planned forest production. These data form the necessary economic background needed by Federal, State, and private agencies dealing with forest, industrial, and social programs and policies.

The work is handled by statistically trained foresters in the Washington office and at several of the western forest experiment stations. Under a cooperative agreement with the Bureau of the Census, data are obtained from the forest industries concerned by a canvass and are then compiled, analyzed, and published.

3. Pulp and paper. -- This work includes studies of the suitability of various woods for pulps and papers and the development of new and improved manufacturing processes.

The value of pulp and paper products made annually in the United States is, roughly, \$1,000,000,000. The domestic consumption of wood for paper is approximately  $7\frac{1}{2}$  million cords (about 10 percent of which is imported), valued at \$58,000,000. In addition, wood pulp and paper are imported to the equivalent of about 6 million cords of wood.

The use of wood for pulp far exceeds that of any other raw material and, although the quantity thus used constitutes only about 5 percent of the total timber cut of the United States, it is of large importance by virtue of being a profitable outlet for a class of timber and for wood wastes having practically no other value except as fuel. Furthermore, the removal of much of this material (as thinnings, etc.) is a feature of good forestry.

Looking to the future, making the United States self-sufficient as to pulpwood requirements could mean doubling the national income from pulpwood, with added large values from manufacture, and jobs for 250,000 more persons than were engaged in the pulp and paper industry in 1929.

Definite progress has been made by the constant search for new or modified processes that will enable using woods other than spruce, which now supplies 70 percent of our pulp and paper requirements. As a result of work by the Forest Service and other organizations, much prominence has recently been given in the press to the Southern pines as a possible source of newsprint. This work on Southern pine will be continued, as will the work to find a process adapted to pulping Douglas fir, especially in the form of woods and mill waste, of which enormous quantities are available; and also the work to check stream pollution by developing methods of recovery and re-use of waste cooking liquors.





4. Strength of wood. -- This work includes studies of strength and related properties of wood and improvement in design of structures, containers, and other wood products.

Besides its importance to the average citizen and home builder, this project has a vital relation to the utilization of timber and the liquidation of forestry investments. Building construction normally consumes more than 60 percent of our annual lumber production, a large proportion going into small houses. In recent years, however, the use of wood in buildings in comparison with other materials has shown a great decline, chiefly because lumber in construction does not reflect the modern trends toward lower costs in the handling and assembly of other materials.

Improvements in the engineering of wood construction such as are now under study at the Forest Products Laboratory to make possible the building of simple and inexpensive but thoroughly satisfactory wooden houses would mean more desirable homes for families with small resources as well as new life in the construction industry. New developments in heavy timber construction which are now under investigation also promise a great advance in engineering economy. About one-sixth of the total lumber production is used for boxes and crates. Improvements in these and other containers benefit the consumer through their effect on the cost of shipping the products he uses.

This project involves strength tests of the clear wood of all commercially important species, both from virgin and second-growth stands in various forest regions; investigations of factors affecting properties, such as defects, moisture content, and weight; appraisal of the effect of preservative, seasoning, and other processes; and determination of the efficiency of nails, bolts, screws, glues, and other mediums for joining wood members or parts.

5. Seasoning and physical properties. -- This work includes studies of kiln drying, air seasoning, and storage of lumber; of the moisture content of wood in use; of seed-extraction equipment; and of the insulation of buildings.

Improper seasoning methods and poor storage, handling, and construction practices cause losses of more than \$100,000,000 annually. They include the entire loss of certain species which can not now be seasoned; the loss of footage and value through degrade; and the damage from swelling, shrinking, and warping of fabricated products and structures. The reduction of these losses, in whole or large part, is the goal of the Laboratory's work.

Kiln-drying principles and methods developed at the Laboratory have revolutionized the kiln-drying industry. More than half the kilns built in the United States in the past five years are of the internal fan type developed at the Laboratory.

6. Chemical composition and wood utilization. -- This work includes studies of the chemical composition and utilization of wood; of physical-chemical structure and properties; and the development of improved and new chemical processes and products.



Wood constitutes the largest and most convenient source of cellulose, one of our most important raw materials. Chemical means must be used in isolating the cellulose because the lignin with which it is surrounded resists all other methods. Science confidently looks forward to the conversion of cellulose into other important commodities in addition to paper, artificial silk, fabric, cellophane, lacquers, and plastics for which it is now used. Lignin comprises one-quarter of the wood but, because of its chemical complexity, no method of utilizing it has been devised. It is wholly wasted in the pulping processes. Since both cellulose and lignin must be isolated by chemical means and converted into other commodities by chemical processes, the economic importance of a thorough knowledge of their chemical nature can hardly be overestimated.

The chemical composition of wood substance, the arrangement of constituent parts in the wood cell, the size and spacing of the cells, and the variation of all such characteristics according to species and growth conditions are intrinsic factors which determine the useful properties of wood in mass. The aim of this project is to attain a scientific understanding of these factors, which is essential to the best results in growing the wood, in its selection, its seasoning and handling, its impregnation with preservatives, its use in construction, and its conversion into pulp and other products. The work involves the conversion of wood waste into wood-distillation products, grain alcohol, plastics, and other useful materials.

7. Wood preservation. -- This work includes studies of wood treatments to increase resistance to decay, insects, and fire; and of coatings, paints, glues, and laminated construction.

Rail transportation costs depend to a considerable degree upon economy and efficiency in the use of wood for railway ties, bridges, poles, piling, and other construction. The railroads use nearly one-fifth of the total annual lumber production and spend over \$100,000,000 per year for wood and much larger sums for its treatment and installation. Preservative treatment has greater influence than any other factor in reducing annual costs for wood used by railroads. Likewise public-utility costs are influenced by the efficiency obtained in the use of poles and other wood in the distribution systems.

Fire losses in wooden structures constitute an enormous loss that can be reduced by the discovery of cheap and effective fireproofing methods. The cost to home owners of maintaining the paint on their property is estimated at \$375,000,000 annually. The strength and durability of glue joints have a profound influence upon the service given by glued products, for which the public pays about \$1,000,000,000 per year. Losses from defective gluing are heavy. The performance of wood in floors, furniture, house trim, aircraft, and numerous other uses is impaired by shrinking and swelling with moisture changes, the prevention of which is of the highest importance in maintaining markets for wood. The work under this project is largely of direct value to the consumer.

The work involves experiments to improve wood preserving processes; service records of treated material subjected to conditions of ac-





tual usage; records of the lasting qualities of various paints applied to wood panels of different species and exposed in various regions; tests to determine the fire resistance of both small pieces subjected to fire-resistant treatments and of full-sized structural units; and the improvement of glues and gluing methods.

8. Wood structure and growth. -- This work includes the microscopic identification of wood; and studies of the relation of growth conditions to wood quality, the relation of structure to properties, and the formation of resin.

Knowledge of wood structure is essential in identifying the thousands of wood and pulp samples submitted by Government officials and the public. Such identifications aid in selecting the right kind of wood for a given purpose in adjusting disputes between buyers and seller and many times have proved very helpful in criminal cases involving wood.

Knowledge of the relation of growth conditions and structure to properties makes it possible to overcome trade prejudices and to broaden the uses of wood, to safeguard the public against defective material, and thus to increase the value and efficiency of wood in service. The information obtained is of value in selecting species for reforestation, in the profitable use of marginal agricultural lands and overflow lands for producing future forest crops, and in controlling the growth factors which influence the properties of the wood.

#### (k) FOREST SURVEY

	Regular	Emergency	Total
Appropriation, 1939.....	\$250,000	\$13,407	\$263,407
Budget Estimate, 1940.....	250,000	- -	250,000
Net change.....	- -	-13,407	-13,407

#### PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)	Decrease
Forest survey:				
Regular funds.....	\$219,742	\$250,000	\$250,000	- -
Emergency relief funds.....	20,119	13,407	- -	-\$13,407
Total.....	239,861	263,407	250,000	-13,407
Unobligated balance (regular funds).....	258	- -	- -	- -
Total (all funds):				
Regular funds.....	220,000	250,000	250,000	- -
Emergency relief funds.....	20,119	13,407	- -	-13,407
Total.....	240,119	263,407	250,000	-13,407





## WORK UNDER THIS APPROPRIATION

The Forest Survey is specifically authorized by Section 9 of the Act of May 22, 1928 (McSweeney-McNary Forest Research Act), which provides that the Secretary of Agriculture shall cooperate with appropriate officials of each State, either through them or directly with private and other agencies, in making a comprehensive survey of the present and prospective requirements for timber and other forest products in the United States and of timber supplies, including a determination of the present and potential productivity of forest land therein and of such other facts as may be necessary in the determination of ways and means to balance the timber budget of the United States.

The work includes an authoritative nationwide inventory of the extent, location, and condition of forest lands; the quantity, kinds, quality, and availability of timber now standing on these lands; the rate of depletion through cutting, fire, insects, disease, and other causes; the current and probable future rate of timber growth and the productive capacity of our forest area; and the present and probable future requirements for forest products in the different parts of the country by all classes of consumers, including many major industries. It also includes analyses of the relation of these findings to one another and to other economic factors as a basis in formulating policies, principles, and plans of forest-land utilization. It involves both field surveys and the compilation of existing data from a great variety of sources.

The Survey is currently obtaining forest resource information long desired and now vitally important as a guide in directing the course of national measures involving conservation and land use, such as balance of growth and depletion to build up growing stock and bring into effect sustained yield; correlation and distribution of industrial requirements with forest productive capacity of the soil; public acquisition of land for forest purposes; reversion of submarginal agricultural land to forests; Civilian Conservation Corps programs; Tennessee Valley development; employment opportunities; and creation of permanent forest communities. The accumulation and interpretation of data are far behind the current demand for information.

The Survey is conducted under the work project "Forest Survey" and mainly in the regions served by the following forest experiment stations:

(a) Appalachian. -- It is especially important to push work here because of closeness to consuming centers, imminent pulp expansion and corresponding timber requirement, the farm woodlot situation, and dearth of economic information on the forest resource situation in the region. This region of 75 million acres includes extensive areas of pine now being threatened by excessive pulp-mill expansion and important stands of highly prized hardwoods being cut without proper provision for regenera-

THE LITERATURE OF THE FINE ARTS

The literature of the fine arts is a vast and varied field, encompassing a wide range of subjects and disciplines. It includes the study of the history and theory of art, as well as the analysis of individual works and movements. The literature of the fine arts is often characterized by its interdisciplinary nature, drawing on insights from fields such as history, philosophy, and psychology. This literature is essential for understanding the cultural and social context of art, and for appreciating the creative process of the artist. It provides a framework for critical analysis and interpretation, and is a key component of any comprehensive study of the fine arts. The literature of the fine arts is also a reflection of the changing tastes and values of society, and it plays a significant role in shaping the artistic canon. Through its study, we can gain a deeper understanding of the human condition and the role of art in our lives.

tion. It is an important timber-producing area, close to consuming centers, going through industrial and rural change and expansion, characterized by a high percentage of community dependence on timber and important watershed value -- all these indicate the necessity of a realistic economic and forest program. Basic data for such a program result from the Survey. Field work is under way on a modest scale; the information is urgently needed.

(b) California. -- Limited Federal funds have restricted work here to the preparation of a forest cover type map to fill general needs and be of special use in the remaining steps of the work. The other phases of the Survey will follow as rapidly as funds become available.

(c) Lake States. -- Primary field work is nearly complete for the 60 million acres of forest land. In close cooperation with the States of Michigan, Wisconsin, and Minnesota, work toward compilation, interpretation, and release of the information collected is going forward.

(d) Northern Rocky Mountain. -- Because of the regional and national importance of the 28 million acres of forests in this territory, especially the highly prized white pine, the Federal Government is spending large sums of money for fire and tree disease protection. In the public interest also there is an incessant demand for forest resource data upon which to base land-use plans for the four Northwestern States. Field work is only about half done.

(e) Pacific Northwest. -- In addition to the type maps and preliminary reports for the Douglas-fir belt of Oregon and Washington, already released, measurable headway has been made toward the final report for this area which will give complete factual forest resource data and policies for economic land use. This area supports the largest remaining supply of virgin timber yet is confronted with an unsatisfactory, unplanned forest situation. Survey reports supply data basic to sustained yield plans, involving both public and private timberland, industrial requirements, and policies for forest units; they also supply information on intent of ownership and point out critical areas. With the completion of the field inventory of the pine types of eastern Oregon and Washington, effort is now directed to the compilation and analysis of data and to the preparation of a comprehensive report. During the year major final reports for this area will be pushed toward completion and work will be initiated to keep the forest resource data up to date.

(f) South. -- Encompassing over 150 million acres, which takes in the naval-stores district, the bulk of the Southern pine lumber-producing stands, and the chief commercial hardwood area of the Nation, including the heavy dependent population, this region ranks near the top as a fertile place to work out sound, long-time forest land-use management. Except for Texas and Oklahoma, where a small amount of work remains, the field inventory is practically finished. Present work includes compilation, analysis, interpretation, and report preparation for the tremendous amount of data collected. Considering demands for special reports on certain phases of the work, satisfactory progress has been made. Plans are being developed to keep the forest-resource information up to date.



## (1) FOREST ECONOMICS

	Regular	Emergency	Total
Appropriation, 1939..	\$121,295	\$9,720	\$131,015
Budget Estimate, 1940	131,295	- -	131,295
Net change.....	<u>10,000</u>	<u>-9,720</u>	<u>+280</u>

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)	Increase or decrease
1. New public domain:				
Regular funds.....	\$24,705	\$24,350	\$24,350	- -
Emergency relief funds.....	30	20	- -	-\$20
Total.....	24,735	24,370	24,350	-20
2. Private forestry:				
Regular funds.....	67,939	67,945	77,945	+10,000(1)
Emergency relief funds.....	14,557	9,700	- -	-9,700
Total.....	82,496	77,645	77,945	+300
3. Stumpage, log, and lumber prices:				
Regular funds.....	13,685	14,000	14,000	- -
Emergency relief funds.....	- -	- -	- -	- -
Total.....	13,685	14,000	14,000	- -
4. Range economics:				
Regular funds.....	14,906	15,000	15,000	- -
Emergency relief funds.....	- -	- -	- -	- -
Total.....	14,906	15,000	15,000	- -
Total obligations:				
Regular funds.....	121,235	121,295	131,295	+10,000
Emergency relief funds.....	14,587	9,720	- -	-9,720
Total.....	135,822	131,015	131,295	+280
Unobligated balance (regular funds).....	60	- -	- -	- -
Total (all funds):				
Regular funds.....	121,295	121,295	131,295	+10,000
Emergency relief funds.....	14,587	9,720	- -	-9,720
Total.....	135,882	131,015	131,295	+280







## INCREASE

(1) An increase of \$10,000 is recommended in regular funds under this item for extending private forestry investigations, including studies of the economic possibilities of the rehabilitation, management, and utilization of timber resources.

Reliable forest economic information is the indispensable basis for the general attainment of forestry on the forest lands of this country; for sound forest policies; and for effectuating prospective programs of the President's Joint Congressional Committee. The economic studies of the Forest Service are financed on an inadequate basis. This increase is essential for studies of economic factors in forestry practice, such as costs and returns, the efficient use of capital in forest utilization enterprises, and the correlation of forest rehabilitation and management with the welfare of needy local people. The work will be started at the Southern Station, with participation by the Washington Office.

## WORK UNDER THIS APPROPRIATION

General. -- This is a series of studies which, in correlation with other forest research, strikes directly at efficient and economical ways of attaining the important forest land-use objectives upon which sound forest industrial plans must be based.

This work is specifically authorized by Section 10 of the Act of May 22, 1928 (McSweeney-McNary Forest Research Act), which provides for investigations of costs and returns and the possibility of profitable reforestation under different conditions in different forest regions; of the proper function of timber growing in diversified agriculture and in insuring the profitable use of marginal land, in mining, transportation, and in other industries; of the most effective distribution of forest products in the interest of both consumer and timber grower; and for other necessary economic investigations of forest lands and forest products. The work is conducted under the following projects:

1. New public domain investigations. -- A "new public domain" is being created by the abandonment and reversion to public ownership through tax delinquency of cut-over forest land. This project is investigating the extent and trends of reversion in different regions, the feasibility of using the land for forest purposes, the desirable balance of ownership between Federal, State, and other public agencies, and the methods and aims of public administration and use. These investigations are conducted in the following regions:

(a) California. -- This State has exceptionally acute and complicated problems of land use, especially in its 40 million acres of foothill area which constitutes a wide margin of conflicting use between the forested mountains and the agricultural valleys. Excessive overgrazing has long been the rule and has seriously depleted the forage-



producing capacity of the grazing lands. Former timber wealth is gone; the livestock industry is in serious straits; agriculture is precarious; population and wealth are declining; communities are in distress; lands are tax delinquent, and county governments are pinched. Land abuses in the marginal foothill zone further combine with destruction of the forests at higher elevations to accelerate erosion and produce serious disturbances in the annual water crop, upon the integrity of which all other crops in most of California depend. Through readjustments of land use many of these conditions can be ameliorated, and the high costs of local government services, such as roads and education, in sparsely populated areas, can be materially reduced. Fundamental information of first importance in connection with corrective programs of land-use planning will be supplied as a result of land-utilization studies by the California Experiment Station.

(b) Lake States. -- The abandonment of cut-over land has reached a more acute stage in the Lake States than in any other region. At least 20,000,000 acres of land have reverted to public ownership or are suffering under long term delinquency. This study, prosecuted in cooperation with other Federal, State, and local agencies, is already supplying information and advice of vital importance to the formulation and application of constructive land-utilization plans, including the correlation of agricultural and forest use, the greatly expanded program of Federal acquisition and the development of State and county forest systems, in the Lake States.

(c) Pacific Northwest. -- The destructive cutting of privately owned forest land in Oregon and Washington; the serious and increasing extent of tax delinquency, forfeiture, and abandonment of these lands; and the attempts to settle them for agricultural purposes have produced deplorable physical, economic, and social results. The instability of forest-land ownership is increasing; precipitate losses are taking place in tax base and tax receipts essential for the maintenance of public services; and industries and the opportunity for labor are being lost. Added to these factors is the continued and uncontrolled practice of placing settlers on forest lands unsuited for agricultural purposes and remote from established roads, schools, and other advantages of community life, where fire is a hazard to life and property and where their presence adds to the burden of property owners, taxing jurisdictions, and social agencies. But no legal control over these practices and no reasonably lasting solution of these problems are possible unless and until local awareness takes place, a delineation between forest and other lands is made, and ways of stabilizing ownership, employment, and social betterment are developed.

(d) South. -- The average of forest land forfeited to public ownership through nonpayment of taxes has increased to such an extent during recent years as to constitute a major problem in the fiscal affairs of the several States and their minor divisions and an even greater problem in forest land-use planning.

The analysis of the causes and determination of the extent of this situation is one of the basic requirements in the development of a sound forest land-use policy. Data already available from this study are in demand by the Agricultural Adjustment Administration, State Planning Boards,





State Foresters, and other agencies and individuals. These agencies, together with State and local governments, are cooperating.

2. Private forestry investigations.-- Current work includes a search for ways and means of replacing the customary destructive methods of exploitation with the practice of forestry, including sustained yield management on privately owned lands. This requires appraisal of the economic factors in various forest regions that are obstructing forestry practice and the formulation of new operating methods and of other means, including needed public assistance, that will aid in overcoming those obstacles. The work also includes studies of the financial aspects of forestry, especially of the costs and returns from timber growing, to determine for various forest regions where and under what economic conditions forestry may be successfully practiced; also a study of the potential contributions of forestry to community stability and prosperity. These investigations are being conducted mainly in the following regions:

(a) Pacific Northwest.-- The Douglas-fir belt includes one-third of our remaining saw timber. Three-fifths is in private ownership and characterized by destructive utilization practices; cut-over land is often rendered completely unproductive by successive burning; sawmill capacity is far in excess of sustained-yield capacity or market requirements. Altogether it represents the most serious and baffling "sore spot" in the Nation's forest economic situation. This study is furnishing vital information as to practical and profitable means of converting the industry to sustained-yield management, including revolutionary changes in the mechanics of logging and in methods of cutting.

In the Ponderosa pine belt present operating practices are reducing potential rates of annual growth from as high as 200 to as low as 10 to 25 board feet per acre. This study will provide basic information needed in fixing diameter cutting limits, spacing of railroad spurs, skidding distances, and desirable types of machinery--in brief, information necessary for the elimination of wasteful and uneconomic practices, and for the stabilization of lumbering operations, communities, and labor conditions.

(b) South.-- Most of the 200 million acres of forest land is privately owned. Because of its enormous potential productive capacity and favorable location, the region is the logical source of timber for much of the eastern United States and for export trade. The forest resource is the basis of the world's largest naval-stores industry. But forest productivity has seriously deteriorated and industry has correspondingly suffered as the result of uneconomic practices. If the forest-products industries are to be rehabilitated, the practice of forestry must be installed on private land and forest productivity must be restored.

An analysis of the cost of growing timber and the returns to be derived therefrom -- in other words, the conditions under which private forestry will be practicable -- is especially needed. This study is designed to supply that information. The development of private forestry is of the utmost importance, not only from the standpoint of the region itself because of the extent to which local economy must be based upon the forest resource, but to the whole eastern United States.





(c) Northeast.-- The purpose of the work here is to obtain the technical basis for and to help develop to the point of self-support cooperative timber production, manufacturing, and marketing enterprises, particularly for farmers and other small owners. Unrestricted cutting of timber on farm woodlands largely prompted by heavy demand from adjacent industrial population have depleted the available timber to a point where many industries have been forced to move to other regions. Returns to woodland owners from the sale of timber are relatively low and realized only once in several decades. Manufacturing and marketing of forest products is generally on a haphazard and uncertain basis. Specifically, the procedure is to study the possibilities of cooperative management of small timber holdings, particularly farm woodlands, in typical natural units, with the belief that proper forest-management methods will permit a regular and dependable source of income to farmers and others. Studies in methods of cutting, transportation, manufacturing, and marketing are also included.

(d) Central.-- This study, initiated in 1937, has the same general objectives and is being conducted in the same general manner as the Northeast investigations described in the preceding paragraph. A steady demand for timber in the agricultural sections of the Central States provides very favorable opportunities for profitable forestry.

(e) Lake States.-- The farm woodlands of the Lake States are potentially a very important feature of farm economy. They furnished forest materials valued at \$37,000,000 in 1929. With the depletion of virgin timber supplies, wood-using industries are turning more and more to farm woodlands for raw materials, but heavy overcutting is resulting in a steady process of deterioration which is constantly reducing yields and which, if continued, will also reduce income. The purpose of this study, commencing during the current fiscal year, is to develop simple methods of economic organization that will give farmers the benefit of collective action in forest management and in such utilization and disposal of forest products as will improve the quality and quantity of farm woodland production, insure a steady field for labor and income for the landowner, and increase the effectiveness of farm woodlands as soil protection cover.

3. Stumpage, log, and lumber price investigations.--Stumpage and log prices are important elements in the production cost of lumber and other wood products. They are not compiled on a nationwide basis by any other agency. They are necessary in other important economic studies and influence the formulation and development of national, State, and private forest programs and are of value to the industry.

Current work includes the compiling and analyzing of price data for previous years from all available sources; the development of price trends and indexes; the comparison with price trends and indexes of important agricultural crops; the compilation of current price data; and the publication of an annual statistical bulletin. Basic data are collected annually through a cooperative agreement with the Bureau of the Census. Studies to date have been confined mainly to stumpage and log prices. Work on lumber prices is as yet fragmentary because of limited facilities and funds. The project is conducted mostly in Washington.



4. Range economics investigations.--The importance of the range resources of this region and the necessity for their rehabilitation and wise use are being recognized more and more. The purpose of this study, commencing in the fiscal year 1938 will be to determine, for various conditions and combinations of livestock raising and agriculture, what size range unit is best adapted for family economy and how Federal range lands can best be integrated with such units. It is of vital importance in this region that the privilege of range use, particularly of the national-forest ranges, be neither unduly concentrated nor unduly dispersed. It must be distributed in a way that will promote prosperous family units and well-balanced permanent communities. The study will necessarily review the factors underlying economic welfare from the use of range lands in each type of community. It will involve, among other things, an analysis of the economic and social organization and activities of typical communities that are largely dependent on range resources. The results of the study should afford a basis for equitable redistribution as found to be needed. This investigation will supplement, on the economic side, the program of range research provided for under Section 7 of the McSweeney-McNary Forest Research Act.



## (m) FOREST INFLUENCES INVESTIGATIONS

	<u>Regular</u>	<u>Emergency</u>	<u>Total</u>
Appropriation, 1939.....	\$139,152	\$57,200	\$196,352
Budget Estimate, 1940.....	139,152	---	139,152
Net change.....	---	-57,200	-57,200

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)	Decrease
1. Influence of forests on streamflow:				
Regular funds.....	\$66,459	\$66,495	\$66,495	---
Emergency relief funds.....	48,860	32,558	---	-\$32,558
Total.....	115,319	99,053	66,495	-32,558
2. Utilization of water by trees:				
Regular funds.....	45,001	41,305	41,305	---
Emergency relief funds.....	33,406	22,260	---	-22,260
Total.....	78,407	63,565	41,305	-22,260
3. Stabilizing soils:				
Regular funds.....	19,989	16,873	16,873	---
Emergency relief funds.....	1,542	1,028	---	-1,028
Total.....	21,531	17,901	16,873	-1,028
4. Effect of forest cover on climate:				
Regular funds.....	7,635	14,479	14,479	---
Emergency relief funds.....	2,032	1,354	---	-1,354
Total.....	9,667	15,833	14,479	-1,354
<u>Total obligations:</u>				
Regular funds.....	139,084	139,152	139,152	---
Emergency relief funds.....	85,840	57,200	---	-57,200
Total.....	224,924	196,352	139,152	-57,200
Unobligated balance (regular funds).....	68	---	---	---
<u>Total (all funds):</u>				
Regular funds.....	139,152	139,152	139,152	---
Emergency relief funds.....	85,840	57,200	---	-57,200
Total.....	224,992	196,352	139,152	-57,200





## WORK UNDER THIS APPROPRIATION

General.--The research under this program is directed to a determination of the effect of forest, brush, or range cover, or of combinations of them, on soil and water. Its purpose is to determine the extent to which such vegetative cover may serve as the major factor in providing satisfactory conditions of water flow and of controlling erosion on entire watersheds or important parts of watersheds; and the conditions of cover, including extent of cutting and grazing, which will afford the best results. It seeks to ascertain how to conserve soil fertility and moisture for the growing of forest and range forage; to deliver the maximum amounts of usable water for navigation, irrigation, municipal use, power, etc.; to make waste lands productive; to protect against destructive floods; and to safeguard public and private works-- investments which already aggregate hundreds of millions of dollars. It is designed to furnish facts and remedial measures as a basis for action by Federal, State, and other agencies.

Practically every watershed in the United States contains some portion of the 615 million acres of forest land or of the 585 million acres of non-forest range land, or both. The disastrous floods of recent years, the increasing demand for irrigation water throughout the West, the increasing interest in the water resources for recreation, the recognition of the possibilities of controlling siltation of streams and reservoirs, and the shortage of municipal water for many cities and towns during drought years greatly accentuate the problem caused by increasing population and demand for water and focus attention on the value and place of the forest and range cover and its relation to streamflow regulation and the whole water problem. The work is carried on under the following projects:

1. Influence of forests on streamflow.--This activity deals with the effects of natural cover on water supply. It includes studies of the effects of forests on floods and low-water flows, on the regularity of water flow, and, in short, on the effect of natural cover on the water yield. It is to determine how best to manage the forest that favorable conditions of water flow may be maintained. It is to supply some of the basic data needed in planning water developments in forest areas and in planning flood-control projects. It supplies some of the basic framework for policies and programs on the national forests, and on other public and private forest and other wild lands. A number of the earlier established national forests (such as the Angeles, Cleveland, San Bernardino, Tonto, and Mendocino) were created from the public domain in order to protect local water supplies. Recent additions have been made to others, and many thousands of acres of lands in many parts of the United States are being purchased under the Weeks Law to aid in solving the water problem. The proper management and protection of the forest and range cover on many national-forest lands is essential to the continued prosperity of thousands of people dependent upon them for domestic and irrigation water supplies, for flood control, and for sustained and regular streamflow.

Finally, this project determines the relation between the cover as it is and as it might be under various conditions of use and conditions of water flow. Such studies are basic to management policies on all forest lands where water may be and often is of more value for domestic, irrigation, or municipal



use than the forest itself. Work is now under way at the California, Intermountain, Rocky Mountain, Appalachian, Southern, and Lake States Forest Experiment Stations.

2. Utilization of water by trees.--Studies of the utilization of water by trees reveal the amount of water consumed by the forest and so prevented from reaching the streams. Such depletion of soil-water supplies may not be serious in the humid regions, but in the arid sections this depletion may have a profound effect on available water supplies. A knowledge of the consumptive use of water by vegetation, of the conditions under which this use is most pronounced, and of the types of trees that make most demands on the soil-water is essential in the proper management of forests where water may be as valuable as the timber. The results of these investigations to date are showing that certain species are much more economical of water than others and where water is precious should be favored in silvicultural work and in reforestation. Work is under way in the California, Intermountain, Southwestern, Rocky Mountain, and Appalachian Forest Experiment Stations.

3. Soil stabilization.--Under this project are carried those investigations of erosion control necessary on forest and range lands in mountain areas. The studies are to determine methods of holding avalanches, rock slides, and landslips in place and thus preventing heavy losses to property, irrigation enterprises, and water supplies; to develop measures for preventing stream-bed scouring in mountain torrents through the use of such devices as stream barriers, channel paving, detention basins, and bank revetments; to develop special measures for holding soil in place in critical areas where the natural cover has been depleted by fire, cutting, or overgrazing, etc.

The results of such studies have been of inestimable value in developing the program for flood control in such areas as southern California and northern Utah where the debris from depleted watersheds and uncontrolled torrents was of such great volume as practically to ruin many large engineering control works. Results from these investigations are being put into practice currently on the national forests and on many forest areas by such agencies as the CCC, WPA, etc. Work is under way in the California, Intermountain, Southwestern, and Appalachian Forest Experiment Stations.

4. Effect of forest cover on climate.--Studies of the effect of forest on climate are to determine the value of windbreaks and shelterbelts in reducing wind velocity, in reducing transpiration of crops and the evaporation from soil and snow, in getting better distribution of the snow cover, and in safeguarding the crops from excessive temperatures. They are also to determine the effect of forests and other cover on the distribution of snow, on the depth of frost in the soil, on evaporation, and on other climatic factors.

Such investigations have an important bearing on widespread forestry activities. In the Plains region they determine the effect that shelterbelts of different height, width, density, and species have on the local climate. They determine the manner in which trees in a shelterbelt shall be planted, pruned, or thinned, the distance apart between shelterbelts, and their orientation with respect to the direction of the disastrous hot summer winds. In this way they lay the foundation for maximum benefits from shelterbelt and windbreak planting at minimum cost.





In sections where frozen ground may be a factor in floods they determine for forests of different species and densities the depths to which the soil freezes, the distribution of the snow cover in the forest, and its rate of melting in the spring, and the interception and evaporation of rain and snow by the forest canopy. Such information is needed in planning upstream flood-control work, in determining the amount of water available for irrigation from snow melt, and in evaluating the water loss of precipitation through evaporation. Results of such studies are being put into effect in thinning practices on the national forests, in planting programs, and in methods of cutting in regions where such cutting may have a bearing on the water problem.

Work under this project is underway at the the Lake States, Appalachian, and Rocky Mountain Forest Experiment Stations.

(n) TROPICAL FOREST EXPERIMENT STATION

	<u>Regular</u>	<u>Emergency</u>	<u>Total</u>
Appropriation, 1939.....	-----	-----	---
Budget Estimate, 1940.....	\$30,000	-----	+\$30,000
Net change .....	<u>30,000</u>	<u>-----</u>	<u>+30,000</u>

PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)	Increase
Tropical Forest Experiment Station .....	---	---	\$30,000	+\$30,000(1)

INCREASE

(1) A new item of \$30,000 for the establishment of a forest experiment station in Puerto Rico is included in the Budget estimates for 1940. Forests have a vital part to play in the economy of Puerto Rico and the surrounding Caribbean region. There is urgent need for immediately launching a program of forest research to solve the many biological and economic problems impeding the initiation of a suitable forestry program. The purpose of this station will be to lay the scientific foundation for sound forestry practices throughout the American Tropics. It will serve as a much needed center for the reception and dissemination of knowledge in this field between the United States and its Central and South American neighbors. One of its immediate tasks, a problem of major importance in Puerto Rico and other American possessions in the West Indies, will be to develop proper techniques of reforestation and growing timber crops, particularly on steeper slope lands already destroyed for agricultural purposes. This will involve working out methods whereby production of forest crops may be interwoven with agricultural cropping and grazing in some desirable form of land use designed to support its fair share of the Island's large population. The





problem of stabilizing both mountain agriculture and mountain forestry is unquestionably one of the major economic problems of the Island. Lack of an adequate technical basis is greatly impeding the initiation of a satisfactory forestry program along these lines.

#### WORK UNDER THIS APPROPRIATION

This work is specifically authorized by Section 2 of the Act of May 22, 1928 (McSweeney-McNary Forest Research Act) which provides for the establishment of a forest experiment station in the tropical possessions of the United States in the West Indies. Work under this project will include studies of the proper techniques of reforestation and growing timber crops in Puerto Rico and other American possessions in the West Indies, and their effect on the water regime, the proper place of forest crops in the economy of the Islands, and allied problems of utilization, including tests of the mechanical, physical, seasoning, and working properties of important tropical woods.

#### (o) IN ALL, SALARIES AND EXPENSES

##### Changes in Language

Two changes are proposed in the language of this paragraph: (1) the first inserts after the words "In all, salaries and expenses", the following:

"to be accounted for as one fund"

For explanation of this change see general note in these Justifications under Office of Experiment Stations, page 54 .

(2) The second amendment consists of a substitution of the figure "\$1,500" for "\$1,000" and addition of the words "and of the Department of Timber Utilization of the Comité International du Bois." This change will permit the expenditure of a nominal sum (estimated at \$500) from the appropriation for "Salaries and Expenses, Forest Service", as the contribution of the United States to the cost of a cooperative undertaking for the interpretation, translation, and distribution of technical and scientific information on timber utilization badly needed by the workers in that field in the various countries of the world. This expenditure would be made by contributing to the support of the Department of Timber Utilization of the Comité International du Bois, with headquarters in Brussels, Belgium, which is a world-wide clearing house for technical and scientific information on wood utilization.



## (p) FOREST-FIRE COOPERATION

Appropriation Act, 1939.....\$2,000,000  
 Budget Estimate, 1940.....2,000,000

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
1. Forest taxation and insurance investigations.....	\$44,996	\$45,000	\$45,000
2. Cooperation with States in forest-fire prevention and suppression....	1,603,606	1,955,000	1,955,000
Unobligated balance.....	6,405	- -	- -
Total appropriation.....	1,655,007	2,000,000	2,000,000

## WORK UNDER THIS APPROPRIATION

1. Forest taxation and insurance investigations.---This work involves local application studies, in cooperation with State and other agencies, necessary to supplement, adapt, and effect the general conclusions and principles already determined with respect to forest taxation and insurance problems under the widely varying conditions of individual States. Taxation under present methods is generally recognized as one of the greatest obstacles to private forestry practice and a major cause of forest destruction. Interest in forest taxation is widespread on the part of forest owners, State and local authorities, and the agencies concerned with the conservation and development of forest resources. Urgent demand is being made for aggressive Federal assistance in obtaining forest-taxation reform to accomplish the stated objectives of forest conservation and the rehabilitation of the forest-products industries under the recovery measures of the Administration.

2. Cooperation with States in forest fire prevention and suppression.---Forty States and the Territory of Hawaii cooperate with the Federal Government in forest fire protection under Section 2 of the Clarke-McNary Law. Additional States may qualify for participation during fiscal year 1940. The cooperation is based on agreements which provide for plans of work and annual budgets by the individual States, Federal reimbursement being made after the work has been done and payment therefor made by the State. The Forest Service provides technical assistance to aid in improving standards of work, and to assure compliance with agreements. Active cooperation and leadership is provided in the development and adaptation of new and improved fire-fighting and fire-control equipment and methods. Federal leadership is given in the adaptation of radio for fire-control work.



During the five-year period 1931-1935 an average of 230,000,000 acres were cooperatively protected. The average annual area burned over amounted to 1.2 percent of the total protected area. Highest losses were in the South, where the fire problem is acute, indicating a need for more adequate protection on large areas which are listed as being under some form of organized protection. During the same five-year period (1931-1935) 191,000,000 acres (average) were wholly unprotected from fire. The most authentic figures indicate that 20 percent of the total of this area was burned over annually (average). Annual damage done was estimated at \$41,000,000. Had the annual burn been held to the same percentage as on the protected area, the proportionate damage would have been \$2,460,000, a saving of \$38,540,000.

State and private agencies look to the Federal Government for leadership and assistance in forest fire control. More liberal Federal appropriations are essential to permit this leadership and not compel the Federal Government to relinquish its position and lag behind in a program designed to redeem a public responsibility.

The following table shows, by States, the Federal allotments compared with contributions made by State and private agencies for forest-fire cooperative work conducted under the provisions of the Clarke-McNary Act:



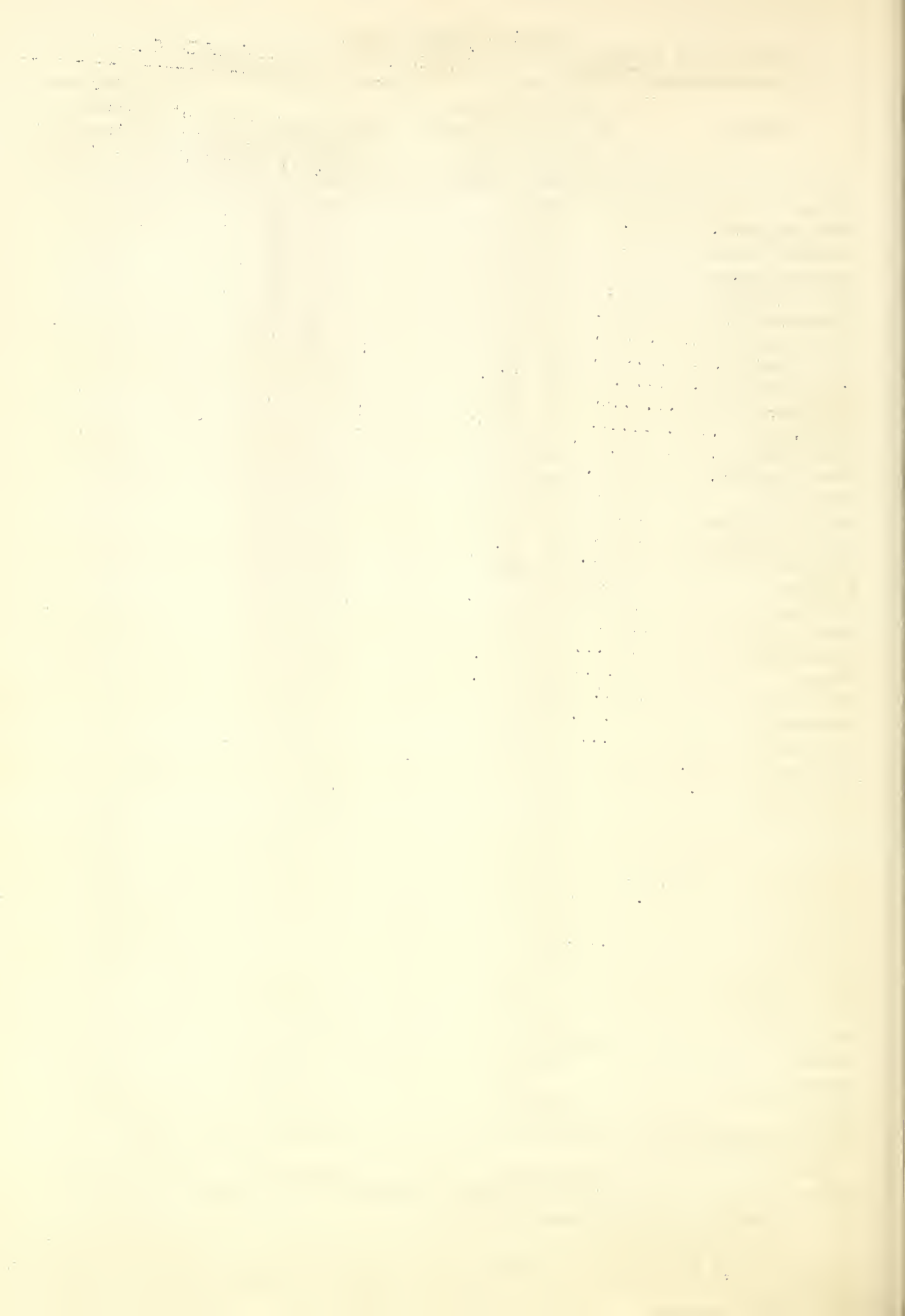


293  
STATE ALLOTMENT DATA  
FOREST-FIRE COOPERATION UNDER SECTION 2 OF THE CLARKE-MCINRY LAW

State	1938 estimate to protect State and private forest land	State and private funds budgeted, fiscal year 1939	Federal allotments, fiscal year 1939 (a)
Maine.....	\$385,000	\$144,988	\$44,671
New Hampshire.....	110,000	69,661	13,732
Vermont.....	44,000	20,556	5,580
Massachusetts.....	209,000	116,247	25,749
Rhode Island.....	27,500	17,642	1,972
Connecticut.....	110,000	82,595	13,192
New York.....	440,000	418,267	62,331
New Jersey.....	198,000	141,615	34,825
Pennsylvania.....	427,000	293,175	44,843
Delaware.....	14,300	10,254	1,659
Maryland.....	88,000	57,266*	11,202
Virginia.....	440,000	87,366	32,496
West Virginia.....	286,000	165,580	30,894
Kentucky.....	275,000	20,261	17,949
North Carolina.....	912,000	119,762	66,696
South Carolina.....	627,000	128,292	45,389
Georgia.....	1,026,000	165,851	74,287
Florida.....	1,241,000	242,875	97,614
Alabama.....	785,000	65,948	55,052
Mississippi.....	670,000	79,146	51,265
Louisiana.....	711,000	160,000	51,002
Texas.....	554,000	104,981	48,270
Oklahoma.....	398,000	20,290	15,840
Arkansas.....	773,000	156,098	51,421
Tennessee.....	516,000	76,036	29,634
Michigan.....	880,000	629,847	113,775
Wisconsin.....	680,000	546,954	76,546
Minnesota.....	995,000	402,387	94,126
Ohio.....	82,000	31,715	6,883
Indiana.....	93,000	31,804	8,845
Illinois.....	48,000	31,216	3,360
Missouri.....	233,000	13,000	13,000
Montana.....	210,000	97,534	23,579
Idaho(N).....	337,000		48,350
Idaho(S).....	43,000	29,235	6,080
South Dakota.....	4,800	2,651	745
New Mexico.....	33,000	12,101	2,465
California.....	1,699,000	1,029,474	180,760
Nevada.....	22,000	7,402	1,905
Hawaii.....	5,500	7,862	865
Washington.....	822,000	794,967	158,521
Oregon.....	1,098,000	605,176	126,040
Total allotments to States.....	18,552,100	7,238,077	1,793,410
Administration and contingent expenses, including impoundment..			161,590
Forest Taxation and Insurance Project.....			45,000
Total appropriation.....			2,000,000

(a) Estimated allotments for 1940 are the same as for the fiscal year 1939, although actual allotments for 1940 will depend upon State expenditures.

\*F.Y. 1938 figures.



## (q) COOPERATIVE DISTRIBUTION OF FOREST PLANTING STOCK

(In 1939 "Cooperative Farm Forestry")

Appropriation Act, 1939..... \$100,000  
 Budget Estimate, 1940..... 100,000

## PROJECT STATEMENT

Project	1938	1939 (Estimated)	1940 (Estimated)
Payment to States for cooperative distribution of forest planting stock.....	\$70,579	\$100,000	\$100,000

## CHANGES IN LANGUAGE

Elimination of the two following provisos in this paragraph is recommended:

(1) "Provided, That no part of the latter sum (\$100,000 appropriated) shall be expended in any State or Territory unless the State or Territory, or local subdivision thereof, or individuals, or associations contribute a sum equal to that to be allotted by the Government or make contributions other than money deemed by the Secretary of Agriculture to be the value equivalent thereof."

(2) "Provided further, That no part of this appropriation shall be used to establish new nurseries or to acquire land for the establishment of such new nurseries."

The foregoing changes will limit expenditures to those objects authorized under section 4 of the Clarke-McNary Act. The provisos eliminated are those which were inserted in the 1939 Appropriation Act at a time when the item carried amounts for activities authorized by the Cooperative Farm Forestry Act. Subsequently these amounts were excluded from the item but the language dealing with them was not changed. Activities authorized by the Cooperative Farm Forestry Act are estimated for under a separate appropriation item carried elsewhere in the 1940 Budget Estimates.

## WORK UNDER THIS APPROPRIATION

The work under this appropriation consists of active cooperation with forty-two States and two territories in the procurement and production of forest-tree seeds and plants and their distribution to farmers for the establishment of windbreaks, shelter-strips, and woodlands upon nonforested and submarginal farm lands. The work is directly administered by the cooperating State agencies, with technical assistance and advice, inspection, and correlation by the Forest Service. Two additional States initiated participation in this cooperative program during the fiscal year 1938. It is contemplated that at least one additional State will resume participation during fiscal year 1939.



The Federal cooperation under this appropriation is provided to the State agencies by means of reimbursement after the work has been performed and paid for by the State. In excess of forty-one million trees were distributed to farmers during the calendar year 1937 under this cooperation, an increase of six million trees over the preceding year.

This cooperative project provides Federal assistance to the individual States in the establishment and maintenance of tree nurseries and other sources of procurement of forest planting stock. No ornamental or shade trees are distributed under the program. The facilities of the project are available to the States for participation in tree-planting programs in connection with CCC work, soil and water conservation work, flood control work, and other tree-planting activities under work-relief programs. There is a rapidly increasing realization by farmers of the economic value of farm woodlands as a supplemental source of cash income, as well as a means of providing materials for the farm. In many regions farm windbreaks are important as a means of climatic protection, livestock protection, and drought amelioration.





## (r) ACQUISITION OF LANDS FOR NATIONAL FORESTS

Appropriation Act, 1939.....	\$3,000,000
Budget Estimate, 1940.....	<u>2,000,000</u>
Decrease.....	<u>1,000,000</u>

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)	Decrease
Acquisition of land for national forests.....	\$2,687,705	\$2,734,000	\$1,900,000	-\$834,000
Unobligated bal- ance.....	194,179	- -	- -	- -
Transferred to the Office of the Solicitor (for legal work).....	118,116	130,000	100,000	- 30,000
Transferred to the Department of Justice (for legal work).....	- -	136,000	- -	- 136,000
Total (all funds):				
Regular funds....	3,000,000	3,000,000	2,000,000	-1,000,000 (1)
ER funds.....	324,800	- -	- -	- -
Total, all funds..	3,324,800	3,000,000	2,000,000	-1,000,000

## DECREASE

(1) The budget estimate provides for a reduction of \$1,000,000 in this item for the fiscal year 1940. The actual decrease in working funds is \$864,000, inasmuch as the allotment of \$136,000 made to the Department of Justice for legal work in the fiscal year 1939 will not have to be made in the fiscal year 1940.

## WORK UNDER THIS APPROPRIATION

The accomplishment of the major objectives outlined in this project are predicated upon the vesting in Federal ownership of privately-owned land within the 85 national-forest purchase units established under the Weeks law of March 1, 1911, as amended, and in additional units which may be established under that Act. The establishment of areas as purchase units is preceded by national and State surveys of forest areas and conditions, the specific determination and definition of areas for which Federal ownership is dictated, and the determination of land ownerships within such areas. Following the establishment of areas and definition of boundaries, the accomplishment of land acquisition entails the solicitation of offers of sale to the United States; detailed examination, estimates, cruises, and appraisals of the offered land to determine their value; negotiations with the owners thereof to obtain options; preparation of detailed reports or review



297

## FILE COPY

ESTIMATES SECTION  
OFFICE OF BUDGET AND FINANCE

by executive officers and the National Forest Reservation Commission; survey of lands in the regions not covered by public survey; prosecution of the work necessary to perfect satisfactory titles; and final vesting of the land in Federal ownership by payment of the purchase price. The major portion of the cost of acquiring lands under this project is borne by the special appropriations or allotments made available for that purpose, but certain of the costs of administrative review and action, particularly in selecting areas to be established as purchase units, are properly chargeable against the general expenses of the Forest Service.

(s) ACQUISITION OF LAND, UINTA AND WASATCH  
NATIONAL FORESTS, UTAH

(This item has been transferred to and consolidated with "Acquisition of Land from National Forest Receipts (Receipt Limitation)," which follows).

## (t) ACQUISITION OF LAND FROM NATIONAL FOREST RECEIPTS (RECEIPT LIMITATION)

Appropriation Act, 1939 (transfer from  
"Acquisition of Land, Uinta and  
Wasatch National Forests, Utah")..... \$50,000  
Budget Estimate, 1940..... 71,000  
Increase..... 21,000

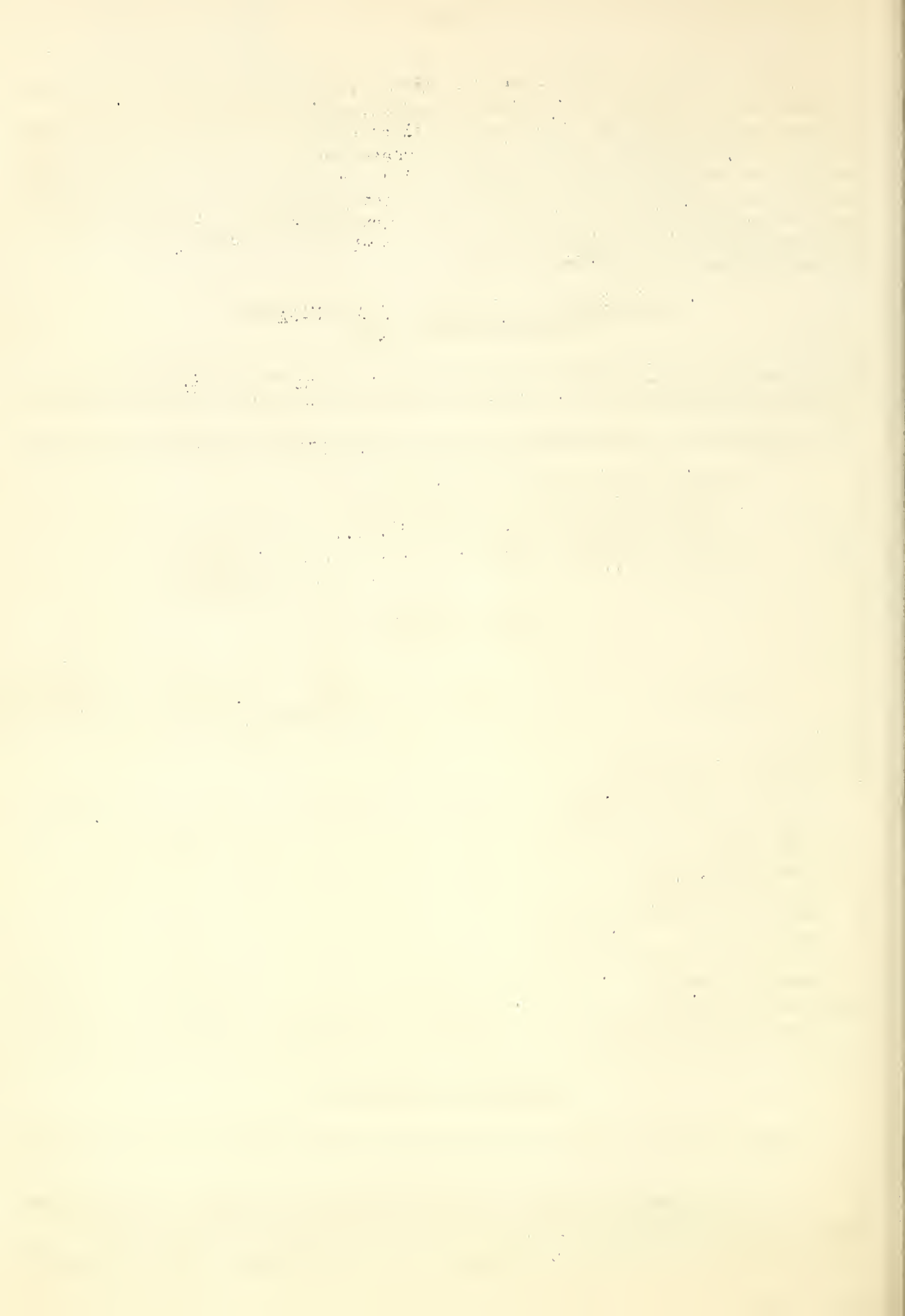
## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)	Increase or decrease
Acquisition of lands in:				
(a) Uinta and Wasatch National Forests (Utah) ..	\$41,566	\$50,000	\$40,000	- \$10,000 (1)
(b) Cache National Forest (Utah only) .....	- -	- -	6,000	+ 6,000 (2)
(c) San Bernardino- Cleveland National Forests (Riverside County, Calif. only) .....	- -	- -	15,000	+ 15,000 (3)
(d) Nevada-Toiyabe National Forests (Nevada) .....	- -	- -	10,000	+ 10,000 (4)
Unobligated balance .....	8,434	- -	- -	- -
Total appropriation .....	50,000	50,000	71,000	+ 21,000

## INCREASES OR DECREASES

The increase of \$21,000 in this item for the fiscal year 1940 consists of:

(1) A decrease of \$10,000 for the acquisition of lands in the Uinta-Wasatch National Forests (Utah). The Act of Congress, approved August 26, 1935 (49 Stat. 856), granted authority to the Secretary of Agriculture to acquire land within the Uinta and Wasatch National Forests, Utah, the cost of



said lands to be paid from the entire receipts of the forests but with a limitation of \$50,000 per annum on the amount so used. Under that authority appropriations of \$50,000 have been made for each of the fiscal years 1938 and 1939. However, in order to avoid undue reduction in the shares of such receipts payable to the counties within the forests, as provided by the Act approved May 23, 1908 (35 Stat. 260), the municipal authorities of the communities in this area have requested a reduction in the annual appropriation for the purchase of land to \$40,000 per year.

(2) An increase of \$6,000 for the acquisition of lands in the Cache National Forest (Utah only). By the Act approved May 11, 1938 (52 Stat. 347), Congress authorized the Secretary of Agriculture to acquire lands within that part of the Cache National Forest situated in Utah and the appropriation for that purpose of the part of the annual receipts from said forest proportionately equal to the part of the forest situated in the State of Utah, which is approximately 50 percent.

The lands to be acquired constitute parts of watersheds used intensively for irrigation and presenting unusual dangers of flood damage and soil erosion. A considerable number of communities and individuals are wholly dependent upon the watersheds involved for both domestic water supply and irrigation water. By extending to the lands the same types of protection and management now applied to the national-forest lands a large measure of public benefit will result. Interested communities and counties plan to donate their holdings to the United States. The cost of the land to be acquired normally will range from \$1 to \$5 per acre. At the rate of appropriation authorized, a long period of time will be required to vest in Federal ownership all the lands which should be so owned; but with the amount annually authorized lands can be acquired in the most critical areas, especially where contiguous to lands already in public ownership or to be donated to the United States, so that definitely beneficial results can be accomplished through the proposed program of acquisition.

(3) An increase of \$15,000 for the acquisition of lands in the San Bernardino and Cleveland National Forests (Riverside County, California) By Act approved June 15, 1938 (52 Stat. 699), Congress authorized the Secretary of Agriculture to acquire lands within that part of the San Bernardino and Cleveland National Forests situated in Riverside County, California; and the appropriation annually of the parts of the entire receipts of said national forests proportionate to their respective areas within Riverside County. Of the San Bernardino National Forest 30.5 percent, and of the Cleveland National Forest 15.5 percent, are within Riverside County. For the fiscal year 1937 the entire receipts of the San Bernardino National Forest were \$43,196.76; of the Cleveland National Forest \$7,883.40. Assuming the same receipts for the fiscal year 1940, which seems probable, the maximum appropriation allowable under the Act of June 15, 1938, would be in the neighborhood of \$15,000.

The lands to be acquired are private holdings intermingled with the present national-forest lands. Due to the dense populations and intensive development of irrigated agriculture, the watersheds of the two forests are of great importance and every practicable means must be employed to protect them from denudation by fire, overgrazing, logging, or tillage. Lands privately acquired prior to the establishment of the forests increase the difficulties of protection and maximum beneficial utilization of national-forest







lands, except where managed under acceptable principles, as by water companies. The acquisition of such lands, therefore, will be an eventual economy. If the authorized appropriations are made, the Department each year will select an equivalent value of the most critical areas and thus gradually establish the more complete Federal control essential to the welfare and security of the dependent communities. Due to rather wide variations in the values of the lands, from \$1 to \$10 per acre, and uncertainty as to which lands most readily can be acquired, it is not practicable to state accurately the number of acres that can be purchased with the proposed appropriation.

(4) An increase of \$10,000 for the acquisition of lands in the Nevada and Toiyabe National Forests (Nevada). By the Act approved June 25, 1938 (52 Stat. 1205), Congress authorized the acquisition of lands in the Nevada and Toiyabe National Forests, Nevada, by the Secretary of Agriculture and the appropriation for that purpose of the receipts from said national forests, not exceeding \$10,000 per year. The receipts of these two forests for 1938 were \$17,174. Within the forests named, and widely intermingled with national-forest lands, are approximately 28,500 acres which prior to the creation of the forests were appropriated under the public-land laws, primarily to control the use of much larger tributary areas of public lands, through ownership of sources of range-water supply or right-of-ways. Private ownership of such lands complicate range management on the national forests and makes it possible for the lands to be used in ways destructive to their highest public values. Public ownership of the lands, therefore, would markedly facilitate the administration and management of the national forests, with possible economies in cost of administration. The land can be acquired at prices ranging from \$2 to \$3.50 per acre, and their total aggregate cost should be less than \$100,000. If the full limit of the authorization were appropriated each year, the acquisition of the necessary lands would require about nine to ten years for completion.

#### CHANGE IN LANGUAGE

In the fiscal year 1939 purchases of land from receipt funds were made in only one area, in two contiguous national forests in Utah. The appropriation item was headed "Acquisition of Land, Uinta, and Wasatch National Forests, Utah (receipt limitation)".

In the fiscal year 1940 purchases are recommended on three additional areas. Rather than set up individual appropriation items for each of these areas, they have been combined into one appropriation item under the heading "Acquisition of Land from National Forest Receipts (receipt limitation)", with separate limitations to apply to each of the four areas involved.

#### WORK UNDER THIS APPROPRIATION

(a) Uinta and Wasatch National Forests. -- This appropriation will be used only for the purchase of land after approval by the National Forest Reservation Commission. When purchased, the lands will be administered as parts of the Uinta and Wasatch National Forests. The privately owned lands in this region are intermingled with lands owned by the Federal Government, and when acquired the cost of administering and protecting them will be small and will permit the Government to initiate effective measures to replace the vegetative



cover which has been depleted by overgrazing, fire, etc. Purchases under the Act of August 26, 1935, have been made to the extent of 10,329 acres in the Uinta National Forest, costing \$35,571, and in the Wasatch National Forest 17,701 acres, at a total cost of \$51,834. It is estimated that approximately 70,000 acres additional will have to be acquired by the Government to effectively control the erosion condition in this area. The acquisition of these lands will be conducted under the procedure outlined under the appropriation "Acquisition of National Forest Lands".

(b-d) Cache, San Bernardino-Cleveland, and Nevada-Toiyabe National Forests.--Acquisition of land in each of these forests will be conducted under the same procedure as outlined under the appropriation "Acquisition of Lands for National Forests."

(u) PAYMENTS TO STATES AND TERRITORIES, NATIONAL FORESTS FUND

Appropriation, 1939 (revised) .....	\$1,114,700
Budget Estimate, 1940 .....	<u>1,275,000</u>
Increase .....	<u>160,300</u>

PROJECT STATEMENT

Project <sup>†</sup>	1938	1939 (Estimated)	1940 (Estimated)	Increase
Payments to States and Territories from national forests fund .....	\$1,214,547	\$1,114,700	\$1,275,000	+\$160,300(1)

INCREASE

(1) An additional \$160,300 is included under this fund because of an anticipated increase in national-forest receipts in the fiscal year 1939. It is estimated that the receipts for the fiscal year 1939 will be approximately \$5,100,000.

WORK UNDER THIS APPROPRIATION

The law requires that 25 percent of all money received from the national forests during any fiscal year be paid to the States and Territories in which the forests are located.

The amount of this appropriation varies each year in direct proportion to national forest receipts during the previous fiscal year. Increases in this appropriation are offset by additional revenue to the Federal Treasury. (16 U.S.C. 500).

(v) PAYMENTS TO SCHOOL FUNDS, ARIZONA AND NEW MEXICO, NATIONAL FORESTS FUND

Appropriation Act, 1939 .....	\$30,000
Budget Estimate, 1940 .....	<u>30,000</u>



## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
Payments to school funds, Arizona and New Mexico, national forests fund .....	\$27,995	\$30,000	\$30,000

## WORK UNDER THIS APPROPRIATION

At the close of the year there is paid to the States of Arizona and New Mexico such proportion of the gross proceeds of all the national forests within those States as the area of land granted to the States for school purposes within the national forests bears to the total area of all national forests within the States. These payments are required by the Act of June 20, 1910 (36 Stat. 562 and 573), which provides "That the grants of Sections two, sixteen, thirty-two and thirty-six to said State, within national forests now existing or proclaimed, shall not vest the title to said section in said State . . . but said granted sections shall be administered as a part of said forests, and at the close of each fiscal year there shall be paid to the Secretary of State, as income for its common-school fund, such proportion of the gross proceeds of all the national forests within said State as the area of lands hereby granted to said State for school purposes which are situated within said forest reserves . . . may bear to the total area of all the national forests within said State . . . the amount necessary for such payments being appropriated and made available annually from any money in the Treasury not otherwise appropriated."

## (w) ROADS AND TRAILS FOR STATES, NATIONAL FORESTS FUND

Appropriation Act, 1939 .....	\$510,000
Budget Estimate, 1940 .....	<u>510,000</u>

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
Roads and Trails for States, national forests fund .....	\$476,030	\$510,000	\$510,000
Expended from prior year appropriations .....	- 76,030	- -	- -
Total appropriation ...	400,000	510,000	510,000

## WORK UNDER THIS APPROPRIATION

10 percent of all moneys received from the national forests during each fiscal year is available at the end thereof to be expended by the Secretary of Agriculture for the construction and maintenance of roads and trails within the national forests in the States from which such proceeds are derived. (16 U.S.C. 501)







(x) COOPERATIVE WORK, FOREST SERVICE  
(Trust account)

Appropriation Act, 1939 ..... \$1,000,000  
Budget Estimate, 1940 ..... 1,000,000

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
1. Construction of improvements .....	\$302,443	\$300,000	\$300,000
2. Maintenance of improvements .....	90,552	70,000	70,000
3. Prevention and suppression of forest fires ....	370,571	356,000	356,000
4. Disposal of brush and other debris in timber-sale operations .....	204,833	190,000	190,000
5. Forest investigations ..	47,260	40,000	40,000
6. Administration .....	27,102	25,000	25,000
7. Reforestation .....	14,555	14,000	14,000
8. Refunds to cooperators .	7,438	5,000	5,000
Unobligated balance .....	7,881		
Total appropriation .....	1,072,635	1,000,000	1,000,000

## WORK UNDER THIS APPROPRIATION

Contributions are made to the Forest Service by individuals, communities, and associations for improvement work, fire control, forest investigations, slash disposal of timber-sale areas, and administration of privately owned land within national-forest boundaries and are deposited to this fund. Expenditures are controlled by the Forest Service.



## SUPPLEMENTAL FUNDS

1. Direct Allotments

Projects	Obligated 1938	Estimated Obligations, 1939	Estimated Obligations, 1940
1. <u>Special Research Fund, Department of Agriculture</u> : For special researches on forestry and forest products .....	\$8,663	\$5,800	\$3,600
2. <u>Conservation and Use of Agricultural Land Resources</u> : For examination of privately-owned range land in connection with range-conservation program; for field administration of naval-stores conservation program; and for aerial photography .....	437,248	39,145	39,145
3. <u>Working Fund, Agriculture, Forest Service (War, Flood Control, Mississippi River and Tributaries)</u> : Surveys and appraisal of lands to be acquired by War Department ....	32,586	1,399	- -
4. <u>Working Fund, Agriculture, Forest Service (Federal Power Commission)</u> : Examination of power development located on national-forest lands .....	1,306	1,200	1,200
5. <u>Flood Control, General (Transfer to Agriculture) (Forest Service)</u> : Preliminary examinations and surveys on selected watersheds authorized by Flood Control Acts ....	119,359	750,685	750,685
6. <u>Emergency Relief, Agriculture, Administrative Expenses (Transfer from W. P. A.) (Forest Service)</u> : Administrative expenses in connection with miscellaneous forestry projects (includes \$324,800 for administrative expenses, acquisition of lands in 1938) .....	660,357	240,000	- -
7. <u>Emergency Relief, Agriculture, Forest Service, Public Buildings, Parks, Flood Control, etc. (Transfer from W. P. A.)</u> :			
(a) Mapping boundary tracing, etc. ....	501,504	361,050	- -
(b) Miscellaneous improvements on national forests .....	2,499,232	1,140,879	- -
(c) Rodent, tree insect, and tree disease control .....	475,201	266,533	- -
(d) Range improvements .....	486,569	282,940	- -
(e) Planting and tree nurseries .....	2,223,533	1,497,383	- -
(f) Development of public camping grounds	1,292,048	593,968	- -
(g) Reconstruction of improvements damaged by floods in California .....	102,348	- -	- -
Total .....	(a)7,580,435	(b)4,142,753	- -

(a) For allocation by States, see table which follows.

(b) For allocation by States, see table which follows.



Projects	Obligated, 1938	Estimated Obligations, 1939	Estimated Obligations, 1940
8. <u>Emergency Relief, Agriculture, Soil Conservation Service, Public Buildings, Parks, Utilities, Flood Control, etc. (Transfer from W. P. A.) (Forest Service):</u> For miscellaneous improvements on lands transferred to Forest Service in north-eastern Washington, western Oregon, and Colorado	- -	\$161,346	- -
9. <u>Emergency Relief, Agriculture, Forest Service, Administrative Expenses:</u> For administration, rehabilitation project .....	- -	4,320	- -
Total, Supplemental Funds (Direct Allotments)	\$8,839,954	5,346,648	794,630

(a) Emergency Relief Funds (Item 7) allocated 1938 as follows:

<u>States, etc.</u>	<u>Allotments</u>	<u>States, etc.</u>	<u>Allotments</u>
<u>Project Funds:</u>		<u>Project Funds:</u>	
Alabama .....	\$58,932	Montana .....	\$418,332
Arizona .....	294,918	Nebraska .....	330,302
Arkansas .....	71,318	Nevada .....	121,775
California .....	934,197	New Hampshire .....	3,724
Colorado .....	438,308	New Mexico .....	281,260
Connecticut .....	5,122	New York .....	1,363
District of Columbia .....	39,649	North Carolina .....	97,318
Florida .....	46,182	North Dakota .....	255,228
Georgia .....	64,796	Ohio .....	29,014
Idaho .....	507,518	Oklahoma .....	300,911
Illinois .....	24,430	Oregon .....	406,724
Indiana .....	23,250	Pennsylvania .....	85,565
Kansas .....	274,406	South Carolina .....	18,810
Kentucky .....	81,830	South Dakota .....	323,383
Louisiana .....	61,728	Tennessee .....	47,135
Maine .....	4,923	Texas .....	282,632
Maryland .....	7,379	Utah .....	423,878
Massachusetts .....	4,685	Vermont .....	26,078
Michigan .....	144,677	Virginia .....	67,060
Minnesota .....	119,405	Washington .....	336,193
Mississippi .....	46,236	West Virginia .....	63,142
Missouri .....	126,898	Wisconsin .....	164,844
		Wyoming .....	114,977
		Total .....	<u>7,580,435</u>





(b) Emergency Relief Funds (Item 7) allocated 1939 as follows:

<u>States, etc.</u>	<u>Allotments</u>	<u>States, etc.</u>	<u>Allotments</u>
<u>Project Funds:</u>		<u>Project Funds:</u>	
Alabama .....	\$23,198	Nebraska .....	\$236,839
Arizona .....	128,529	Nevada .....	57,816
Arkansas .....	35,701	New Hampshire .....	3,795
California .....	431,193	New York .....	2,406
Colorado .....	165,405	New Mexico .....	126,644
Connecticut .....	37,696	North Carolina .....	36,543
District of Columbia .....	37,000	North Dakota .....	217,504
Florida .....	15,479	Ohio .....	12,091
Georgia .....	31,093	Oklahoma .....	279,337
Idaho .....	249,564	Oregon .....	221,053
Illinois .....	15,186	Pennsylvania .....	38,640
Indiana .....	10,221	South Carolina .....	17,600
Kansas .....	170,592	South Dakota .....	234,016
Kentucky .....	43,168	Tennessee .....	17,000
Louisiana .....	24,986	Texas .....	262,543
Maine .....	2,132	Utah .....	166,534
Maryland .....	5,608	Vermont .....	8,328
Massachusetts .....	1,742	Virginia .....	27,474
Michigan .....	71,341	Washington .....	145,375
Minnesota .....	49,705	West Virginia .....	26,776
Mississippi .....	28,717	Wisconsin .....	76,593
Missouri .....	59,845	Wyoming .....	56,800
Montana .....	232,945	Total	<u>4,142,753</u>

#### WORK UNDER DIRECT EMERGENCY ALLOTMENTS

These allotments are used for such projects as the construction and maintenance of firebreaks, forest-fire lookout houses, towers and observatories, landing fields, telephone lines, forest roads and trails, housing for forest officers, miscellaneous buildings and structures, planting, maintenance of tree nurseries, thinning of forest stands, fire prevention and control, fire-hazard reduction, construction and maintenance of improvements for recreational use of the forests, control of tree-destroying insects and diseases and of range-destroying rodents, eradication of poisonous range plants and revegetation of depleted ranges, construction and maintenance of range fences and other range improvements; surveys of forest resources such as timber, forage, water, wildlife, and related activities; surveys needed for forest activities, power-resource evaluation and appraisal, and development of the fish and game resources; studies relating to forest, range, and watershed management, protection, development, and utilization; and for other work and the purchase of equipment and supplies incident to or necessary in connection with any projects of the character indicated above.

-----



2. Indirect Allotments (Civilian Conservation Corps  
Work, financed by War Department)

Projects	Obligated, 1938	Estimated obligations, 1939
1. National forests (and miscellaneous) .....	\$19,659,641	\$12,885,600
2. Alaska .....	763,890	825,000
3. State, municipal, and privately owned lands	11,279,797	10,628,880
4. Puerto Rico .....	<u>1,025,991</u>	<u>1,019,000</u>
Total, Indirect Allotments (CCC)	32,729,319	25,358,480

Civilian Conservation Corps (authorized by Acts of March 31, 1933, April 8, 1935, and June 28, 1937; allotment through War Department):

	<u>1938</u>	<u>1939</u> (estimated)
1. <u>Civilian Conservation Corps Work on</u> <u>National Forests</u> (includes a small number of miscellaneous camps) .....	<u>\$19,659,641</u>	<u>\$12,885,600</u>

The number of camps on national forests on July 1, 1937, and July 1, 1938 (all camps on national forests unless otherwise indicated) were:

	<u>July 1, 1937</u>	<u>July 1, 1938</u>
Alabama .....	5	4
Tennessee Valley Authority .....	5	5
Arizona .....	11	11
Arkansas .....	14	11
California .....	49	38
Colorado .....	12	10
District of Columbia (National Arboretum)	1	1
Florida .....	5	3
Georgia .....	9	5
Idaho .....	32	29
Illinois .....	6	4
Indiana .....	3	2
Kentucky .....	8	6
Louisiana .....	6	5
Maine .....	1	--
Maryland (Navy) .....	1	--
Michigan .....	32	24
Minnesota .....	20	16
Mississippi .....	15	9
Missouri .....	11	9
Montana .....	14	12
Nebraska .....	1	1
Nevada .....	2	2
Navy .....	1	1
New Hampshire .....	6	4
New Mexico .....	8	8



	<u>July 1, 1937</u>	<u>July 1, 1938</u>
North Carolina .....	14	8
Tennessee Valley Authority .....	2	1
Ohio .....	4	2
Oklahoma .....	1	1
Oregon .....	17	17
Oregon and California R.R. lands .....	3	..
Pennsylvania .....	6	4
South Carolina .....	8	5
South Dakota .....	10	8
Tennessee .....	8	4
Tennessee Valley Authority .....	15	11
Texas .....	9	7
Utah .....	11	9
Vermont .....	4	3
Virginia .....	14	10
Tennessee Valley Authority .....	2	2
Washington .....	19	16
West Virginia .....	13	7
Wisconsin .....	18	13
Wyoming .....	<u>11</u>	<u>9</u>
Total camps .....	<u>467</u>	<u>357</u>
Total, national-forest camps .....	437	336
Total, Navy camps .....	2	1
Total, Oregon and California R.R. land camps .....	3	..
Total, Tennessee Valley Authority camps .....	24	19
Total, National Arboretum camps .....	<u>1</u>	<u>1</u>
Total .....	467	357

#### WORK UNDER FOREGOING ALLOTMENT

This allotment is used for the pay of supervisory and facilitating personnel necessary for the field work done from C.C.C. camps mainly on the national forests; also for the purchase of necessary equipment and construction materials and for miscellaneous expenses incident to the field work of the camps. The field work on the national forests includes the construction of physical improvements needed for the protection and administration of the forests, tree planting, thinning of young stands of timber, destruction of undesirable timber species, rodent control, etc.

---

	<u>1938</u>	<u>1939</u>
2. <u>Civilian Construction Corps Work</u>		(Estimated)
<u>in Alaska</u> .....	<u>\$763,890</u>	<u>\$825,000</u>

#### WORK UNDER FOREGOING ALLOTMENT

This allotment (Alaska) is used for pay and allowances to dependents of enrolled members of the Civilian Conservation Corps and for salaries and wages of extra supervisory and clerical personnel needed in connection with the work.





It is also used for the purchase of clothing, subsistence, supplies, and camp equipment required for enrolled men of the Corps and for the purchase of construction materials used in the work. Classes of work done under this allotment include construction of trails, minor roads, bridges, water development and improvement, and miscellaneous administrative improvements; roadside clearings and public campground improvement; estimating timber resources; and other miscellaneous work. The men engaged in the work are recruited from the unemployed local residents without regard to age.

---

	<u>1938</u>	<u>1939</u> (estimated)
3. <u>Civilian Conservation Corps Work on State,</u> <u>Municipal, and Privately Owned Forest Land.</u>		
	<u>\$11,279,797</u>	<u>\$10,628,880</u>

Number of camps by States on July 1, 1937,  
and July 1, 1938:

	<u>July 1, 1937</u>	<u>July 1, 1938</u>
Alabama .....	4	3
Arkansas .....	6	6
California .....	10	7
Connecticut .....	11	10
Delaware .....	6	4
Florida .....	8	6
Georgia .....	8	6
Idaho .....	6	4
Illinois .....	7	6
Indiana .....	18	12
Iowa .....	8	8
Kentucky .....	11	8
Louisiana .....	13	11
Maine .....	7	5
Maryland .....	14	10
Massachusetts .....	17	10
Michigan .....	17	13
Minnesota .....	12	11
Mississippi .....	3	3
Missouri .....	9	7
Montana .....	1	1
New Hampshire .....	4	3
New Jersey .....	19	13
New York .....	43	31
North Carolina .....	7	5
Ohio .....	16	12
Oklahoma .....	2	2
Oregon .....	9	9
Pennsylvania .....	56	33
Rhode Island .....	4	2
South Carolina .....	8	8
South Dakota .....	1	..
Tennessee .....	4	4
Texas .....	8	6
Vermont .....	9	6



	<u>July 1, 1937</u>	<u>July 1, 1938</u>
Virginia .....	24	12
Washington .....	8	8
West Virginia .....	12	8
Wisconsin .....	<u>15</u>	<u>12</u>
Total camps on State lands, etc. .	445	325

#### WORK UNDER FOREGOING ALLOTMENT

This allotment is used for the payment of expenses incurred in the conduct of Civilian Conservation Corps work on State, municipal, and privately owned lands, including the purchase of supplies, materials, and equipment used in the work, for payment of salaries and wages of supervisory personnel directing the work of the enrolled men, and for other necessary expenses incident to the work.

The work being accomplished under this allotment includes the protection of State and private forest land from fire by construction of firebreaks, lookout towers, communication systems, truck trails, tool sheds, guard houses, and the fighting of forest fires; protection of State and privately owned forests from the epidemic spread of forest insects and tree diseases; forest cultural measures to improve the forest growth on State-owned lands; and the construction of simple dams and the planting of trees, grass, etc., for the control of erosion and flash runoff at the headwaters of streams.

---

	<u>1938</u>	<u>1939</u> (estimated)
4. <u>Civilian Conservation Corps Work in</u>		
<u>Puerto Rico</u> .....	<u>\$1,025,991</u>	<u>\$1,019,000</u>

#### WORK UNDER FOREGOING ALLOTMENT

This allotment (Puerto Rico) is used for the payment of authorized enrollees and the supervisory personnel engaged in the technical direction of the work projects on the Luquillo National Forest and the insular forests and for the purchase of equipment and supplies incident to the work.

The work projects comprise the construction and maintenance of roads and trails, production of nursery stock, making new forest plantations and thinning old ones, forest thinnings to improve the timber stands within the national and insular forests, and development of a recreational area within the national forest. With a population of 1,500,000, the unemployment situation in Puerto Rico has been acute and, since the enrollment of the 2,350 men has been on a pro rata basis from the 72 insular municipalities, the C.C.C. work has played its part in giving a measure of relief. Camps are not established as they are in the States, since a large proportion of the enrollees live at home and go to and from the work projects.



## PASSENGER-CARRYING VEHICLES

The authorization for the purchase of passenger-carrying vehicles for the Forest Service from the appropriation "Salaries and Expenses" contemplates an increase of \$6,513 (\$54,915 in 1939, \$64,428 estimated for 1940) for this purpose. This \$64,428 will permit the needed replacement of 96 vehicles, at a net average cost of \$620 when exchange allowances are taken into account, and the purchase of 7 additional vehicles at an average cost of \$700. The 7 new vehicles are contingent upon the approval of increases included in the 1940 budget. Three additional vehicles will be needed on private forestry cooperation work, two for Forest Products, and two vehicles will be needed at the new Tropical Forest Experiment Station.

From the appropriation "Forest Roads and Trails" an increase of \$2,668 (\$7,087 in 1939, \$9,755 in 1940) for passenger-carrying vehicles is recommended. All the 16 vehicles which it is proposed to purchase from this authorization are needed for replacement of vehicles now in use at a net average cost of \$610 when exchange allowances are taken into account.

It is estimated that the average mileage of the cars to be replaced, as of June 30, 1939, will be in the neighborhood of 55,000 miles.





BUREAU OF CHEMISTRY AND SOILS

The chemical and technological research of this bureau is merged in the 1940 Estimates with the agricultural engineering research of the Bureau of Agricultural Engineering (see following statement on page <sup>312</sup>) to form the Bureau of Agricultural Chemistry and Engineering. The soil research is transferred to the Bureau of Plant Industry. The transfers from appropriations made in 1939 to the Bureau of Chemistry and Soils are shown in the following table:

Item	Appropriation, 1939	For transfer to Bureau of Agri- cultural Chem- istry and Engineering	For transfer to Bureau of Plant Industry
General administrative expenses.....	\$90,200	\$75,200	\$15,000
Agricultural chemical investigations	372,500	372,500	- - -
Industrial utilization of farm products and by-products.....	236,200	236,200	- - -
Agricultural fires and explosive dusts .....	40,000	(a) 40,000	- - -
Naval stores investigations.....	79,400	79,400	- - -
Soil survey .....	298,708	- - -	298,708
Soil chemical and physical investi- gations.....	76,700	- - -	76,700
Fertilizer investigations.....	263,800	263,800	- - -
Total for 1939 base .....	1,457,508	1,067,100	390,408

(a) This item proposed to be consolidated in 1940 Estimates with "Agricultural Engineering Investigations, Bureau of Agricultural Chemistry and Engineering", which is being transferred from the present Bureau of Agricultural Engineering; all other transfers hereunder to be effected without change in subappropriation title.



BUREAU OF AGRICULTURAL CHEMISTRY AND ENGINEERING

In the regrouping of functions of the Department to facilitate efficient administration, the engineering, technological, and industrial research has been coordinated, and the activities of the Bureau of Agricultural Engineering have been integrated with those of the Bureau of Chemistry and Soils and set up under a Bureau of Agricultural Chemistry and Engineering. In effecting this consolidation, the soil research of the Bureau of Chemistry and Soils has been transferred to the Bureau of Plant Industry, and the irrigation and drainage research of the Bureau of Agricultural Engineering has been transferred in part to the Soil Conservation Service and in part to the Bureau of Plant Industry, as shown elsewhere in these notes. The changes affecting the Bureau of Agricultural Chemistry and Engineering, on the basis of the fiscal year 1939, are reflected in the following summarization:

Bureau and appropriation item	Amount proposed for transfer (1939 base)
<u>Bureau of Chemistry and Soils:</u>	
General Administrative Expenses.....	\$75,200
Agricultural Chemical Investigations.....	372,500
Industrial Utilization of Farm Products and By-products.....	236,200
Agricultural Fires and Explosive Dusts.....	(a)40,000
Naval-Stores Investigations.....	79,400
Fertilizer Investigations.....	263,800
Total, transfer from Bureau of Chemistry and Soils (1939 base).....	1,067,100
<u>Bureau of Agricultural Engineering:</u>	
General Administrative Expenses.....	37,600
Agricultural Engineering Investigations.....	319,469
Total, transfer from Bureau of Agricultural Engineering (1939 base).....	357,069
Total.....	1,424,169

(a) To be merged in 1940 estimates with item "Agricultural Engineering Investigations, Bureau of Agricultural Chemistry and Engineering."

(a) SALARIES AND EXPENSES -- PREAMBLE

Changes in Language

Two changes are recommended in this paragraph, as follows:

(1) Insertion of the word "farm" between "business" and "or other organizations", in order to include farm organizations in the list of groups and agencies with which cooperation is authorized.



(2) Change from \$5,000 to \$15,000 in the amount which may be authorized to be expended from appropriations under "Salaries and Expenses", Bureau of Agricultural Chemistry and Engineering, for erection, alteration, and repair of buildings outside the District of Columbia. Since this \$15,000 includes \$10,000 formerly carried under "Agricultural Engineering Investigations, Bureau of Agricultural Engineering", from which item that authorization has been deleted, there is actually no change in the total limitation on such expenditure.

(b) GENERAL ADMINISTRATIVE EXPENSES

Appropriation, 1939:

Bureau of Chemistry and Soils.....	\$75,200
Bureau of Agricultural Engineering.....	<u>37,600</u>
Total available, 1939.....	112,800
Budget Estimate, 1940.....	<u>112,800</u>

PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
General administration and business service.....	\$112,510	\$112,800	\$112,800
Unobligated balance.....	331	- -	- -
Total.....	112,841	112,800	112,800

WORK UNDER THIS APPROPRIATION

This appropriation provides for the salaries and expenses of the office of the Chief of Bureau and for the administrative units of business management, information and editorial, audits and bookkeeping, estimates and reports, personnel, equipment and supplies, files, and miscellaneous services and records.

(c) AGRICULTURAL CHEMICAL INVESTIGATIONS

Appropriation Act, 1939 (Bureau of Chemistry and Soils).....	\$372,500
Transferred in 1940 Estimates from "Industrial Utilization of Farm Products and By-products", Bureau of Agricultural Chemistry and Engineering (for sweet potato drying investigations).....	<u>+ 20,000</u>
Total available, 1939.....	392,500
Budget Estimate, 1940.....	<u>411,500</u>
Increase.....	<u>19,000</u>





## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)	Increase
1. Cereals, fruits, vegetables, etc., investigations.....	\$155,844	\$154,672	\$173,672	+ \$19,000 (1)
2. Sugars, starches, and fats investigations.....	79,551	118,280	118,280	- -
3. Protein and vitamin investigations.....	28,317	27,960	27,960	- -
4. Fundamental investigations in chemistry, microbiology, and pharmacology relating to agricultural products.....	73,167	72,068	72,068	- -
5. Chemical weed eradication investigations.....	19,557	19,520	19,520	- -
Unobligated balance.....	3,824	- -	- -	- -
Total appropriation.....	360,260	392,500	411,500	+ 19,000

## INCREASE

(1) An increase of \$19,000 is requested to enlarge the Winter Haven (Fla.) laboratory building, construct and install cold storage rooms, and provide necessary refrigeration equipment for research work on the preservation and utilization of fruits and vegetables. The building and equipment at this laboratory are inadequate to provide properly for the research work requested by fruit and vegetable growers in this area. The proposed addition to the present laboratory building will increase the now available space by nearly 3,000 square feet, thus providing for freezing and low temperature storage, as well as cool and cold storage studies, which are essential to the proper prosecution of these investigations.

The necessity for this work is caused by the existence of large amounts of surplus fruits and vegetables remaining after the market requirements for fresh products have been filled. Such surpluses can be made to yield a profit to the growers if freezing technology adaptable to the varieties of fruits and vegetables can be developed. Additional outlets are offered the growers through canning and by the development of new products when the technological problems can be worked out. Additional facilities provided by this increase will enable a more extensive study of possible means of disposing of waste products from the canneries, which now constitute a serious menace to the aquatic life in the Southeastern States, particularly in Florida.

The interest of the Florida people in these investigations is definitely seen by the fact that the present laboratory building was built by public subscription and that the City of Winter Haven donated the land. Title to both land and building was transferred to the Department of Agriculture in 1937.



No other governmental organization is giving attention to investigations of this type. Generally the growers are not organized and, hence, are unable, through their collective activities, to carry on such investigations independently for themselves.

#### CHANGE IN LANGUAGE

The addition of the following wording is proposed in the language of this item:

"of which amount not to exceed \$19,000 shall be available for the construction and equipment of an addition to the U. S. Citrus Products Laboratory, Winter Haven, Florida."

This change is to provide the necessary authorization for construction work at the Winter Haven, Florida, laboratory, for which \$19,000 is included in the estimates for 1940.

#### WORK UNDER THIS APPROPRIATION

General.--The purposes of the investigational work under this appropriation are to widen the markets for farm crops and products therefrom through the development of more extensive uses, chiefly for food and feed purposes; to improve the quality and to better adapt the products to specific market requirements; to investigate the constituents of and to develop crop uses for uncultivated plants; to obtain chemical and technological information necessary for commercial expansion of minor crops in order to increase agricultural diversification; to investigate and devise means of preventing and controlling deterioration of crops during the time which ensues between harvesting and processing to reduce losses from spoilage and deterioration of food and other agricultural products; and to develop methods for the disposal of wastes from food manufacturing plants.

1. Cereals, Fruits, Vegetables, etc., Investigations.--Work under this project is directed towards increasing the efficiency of recognized methods and developing new methods in the processing and preservation of food products, in the prevention of spoilage, and in the utilization of culls, surpluses, and wastes for the manufacture of food and other products. Cereal investigations include the study of problems in baking and malting, with special reference to improving quality of cereal products and the reduction of large losses from spoilage such as is caused by staling and rancidity. Fruit and vegetable investigations are concerned with the various types of food preservation, economical utilization of culls and crop surpluses, and the development of valuable by-products. The portion of the fruit and vegetable crops graded as culls often constitutes from 20 to 30 percent of the total crops and represents that much loss unless methods of profitable utilization are developed. In years of overproduction, the disposal of these surplus crops in the form of by-products acts to stabilize the fresh market. One of the present problems of outstanding importance to the fruit industry is the satisfactory preservation of fruit juices. The quality of fruit suitable for juice extraction is not suitable for direct sale, yet it is highly palatable and of great dietary and commercial value. In connection with the utilization of vegetables, investigations of methods of preservation by freezing are of the greatest importance. Investigations are also conducted to improve processes for making pickles and allied





products. Foods and food products with a value of more than \$3,000,000,000 come within the field served by this project. It is the aim of the work to increase this valuation by expanding the processing of farm products, thereby extending the market for raw materials and adding to the farm price.

2. Sugars, Starches, and Fats Investigations.--This work consists of chemical and technological investigations on the carbohydrate constituents of crops and derived farm products (such as sugarcane, sugar beets, honey, maple products, farm-made sugarcane and sorghum sirups, sweet and white potatoes and other starchy plants, and plants containing miscellaneous carbohydrates), and on fats, oils, and waxes from crops. The object of this work is to increase farm income from these crops and derived products. Investigations are conducted under this project to determine the identity, properties, and content of the carbohydrate and oil, fat, and wax constituents of various crops; to ascertain the factors which influence yield and quality of these constituents and derived products; to devise means which will insure better and more uniform quality and better adaptation to market requirements; to investigate causes of and devise means of controlling deterioration of such crops during the period between harvesting and processing; to obtain the chemical data required for development of minor crops; to investigate the constituents of and to find means of commercially developing uncultivated plants with a view to providing new and valuable crops for diversification. The work on these crops and products, which represent a value of several billions of dollars annually, is also of benefit to processors and consumers of these agricultural commodities.

3. Protein and Vitamin Investigations.--Under this project chemical and biological investigations are made of the nutritive value of foods and feeds with particular reference to their protein and vitamin content, two of the most highly important elements in human and animal nutrition. Proteins differ greatly in their food value. They are complex compounds made up of over twenty constituents called amino acids. Digestibility of a protein depends on its structure. Exact information on the amino acid composition of proteins is meager and fragmentary. The investigations being conducted include isolation of the proteins from raw materials; determination of their properties, composition, and digestibility; studies on methods of analysis of proteins and their constituent amino acids; and studies on the nature and extent of changes that occur in the chemical and nutritional value of the proteins of grains, seeds, and their meals on storage and aging. Extension of our knowledge of the chemistry of proteins is imperative for the farmer for the efficient feeding of farm animals and for the economic utilization of his crops; for the use of proper human diet to maintain health and efficiency; for the right curative and preventive treatment of those suffering from allergic disturbances; for the development of technological uses of proteins in industry; and for advancement in the fields of enzymes, serums, antitoxins, and immunization. Investigations of vitamins include the study of methods and technique of vitamin assay and studies of the effects upon vitamins of certain commercial processes used in the manufacture of food products.

4. Fundamental Investigations in Chemistry, Microbiology, and Pharmacology Relating to Agricultural Products.--This project involves chemical, biochemical, microscopic, and microbial studies of foodstuffs in all phases of their evolution to finished manufactured products. It is the purpose of this work to conduct specific fundamental studies that because of their nature can not be undertaken either by the individual food manufacturers or food or-





ganizations. Among the more important lines of work being conducted are the following: Research on the microbial spoilage of preserved foods -- a phenomenon of widespread occurrence and of special importance now because of the rapid development of new processes for preserving foods; determination of the toxic effects which may result from consumption of human foods containing naturally occurring or artificially added ingredients, such as antimony and cadmium; the pharmacology of naturally occurring ingredients in foods, such as naringin and hesperidin in citrus fruits; isolation and identification of special constituents of plants and plant products that appear to be of special value in nutrition or in the arts -- for example, the ursolic acid of apple pomace and other fruit waste; studies of the color formation of apples and the deterioration of color in tomatoes -- factors of important bearing on the value of the products; research on the nature of various enzyme actions and of their relation to growth, spoilage, curing, and preservation of agricultural products. A proper understanding of the factors responsible for the biochemical changes in food plants and products is essential in preventing losses occurring in the handling, storing, processing, and consumption of farm products; it also has direct application in the improvement of processes which will enhance the quality and edibility of these products, with resultant increase in their uses and in the returns to the farmers.

5. Chemical Weed Eradication Investigations.--Work under this project is directed toward the synthesis, production, development, and application of chemicals for eradication of the bindweed and other noxious weeds. Weeds cost the American farmers millions annually through reduced yields and quality of crops and increased cost of farming. Present investigations include (a) a study of the economics and methods of manufacture of recognized chemical agents for eradication of noxious weeds, with a view toward reducing cost of these chemical agents to the farmer; and (b) the discovery and preparation of new chemical herbicides. All work under this project is done in cooperation with the Bureau of Plant Industry.



## SUPPLEMENTAL FUNDS

Projects	Obligated 1938	Estimated obligations, 1939	Estimated obligations 1940
<u>Special and Technical Investigations,</u> <u>International Joint Commission, United</u> <u>States and Great Britain (State, Transfer</u> <u>to Agriculture), (Bureau of Chemistry and</u> <u>Soils) (Bureau of Agricultural Chemistry</u> <u>and Engineering):</u> For smelter-fumes in- vestigations to determine damage to crops and forests in State of Washington.....	\$7,683	- -	- -
<u>Arbitration of Smelter-Fumes Controversy,</u> <u>United States and Canada (Transfer to Ag-</u> <u>riculture) (Bureau of Chemistry and Soils)</u> <u>(Bureau of Agricultural Chemistry and En-</u> <u>gineering):</u> For smelter-fumes investiga- tions to determine damage to crops and forests in the State of Washington.....	2,245	- -	- -
<u>Expenses, Payment of Indemnity Received</u> <u>from Canada for Damage by Smelter Fumes</u> <u>(Transfer to Agriculture) (Bureau of</u> <u>Chemistry and Soils) (Bureau of Agricul-</u> <u>tural Chemistry and Engineering):</u> Exam- ination and certification of claims arising from smelter-fumes damages.....	5,525	\$9,475	- -
Total, Supplemental Funds (Direct Allotments).....	15,453	9,475	- -



## (d) INDUSTRIAL UTILIZATION OF FARM PRODUCTS AND BY-PRODUCTS

Appropriation Act, 1939 (Bureau of Chemistry and Soils).....	\$236,200
Transferred in 1940 Estimates to "Agricultural Chemical Investigations", Bureau of Agricultural Chemistry and Engineering (for sweet potato drying investigations).....	<u>- 20,000</u>
Total available, 1939.....	216,200
Budget Estimate, 1940.....	<u>191,200</u>
Decrease.....	<u>25,000</u>

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)	Decrease
<u>Industrial Utilization of Farm Products and By-products:</u>				
(a) Hides and skins investigations.....	\$12,328	\$12,207	\$12,207	- -
(b) Tanning materials and tanning processes investigations.....	16,448	16,283	16,283	- -
(c) Leather investigations..	7,698	7,621	7,621	- -
(d) Wastes investigations..	34,343	34,000	34,000	- -
(e) Biological stain investigations.....	500	486	486	- -
(f) Fermentation investigations.....	58,518	58,549	58,549	- -
(g) Lignin investigations..	12,310	12,187	12,187	- -
(h) Chemical conversion of oils, fats, and waxes	25,526	24,517	24,517	- -
(i) Plastics investigations	10,834	10,725	10,725	- -
(j) Motor fuels from agricultural sources.....	14,774	14,625	14,625	- -
(k) Construction of laboratory at Weslaco, Texas	- -	25,000	- -	-\$25,000(1)
Unobligated balance.....	2,964	- -	- -	- -
Total appropriation..	196,243	216,200	191,200	- 25,000

## DECREASE

(1) The decrease of \$25,000 in this item for 1940 is due to the dropping of a nonrecurring item for construction of a laboratory at Weslaco, Texas, provided for in the 1939 Act.





320  
 INDUSTRIAL UTILIZATION OF FARM PRODUCTS AND BY-PRODUCTS

## CHANGE IN LANGUAGE

It is recommended that the clause "of which not to exceed \$25,000 shall be available for the construction and equipment of an experimental laboratory building, to be erected on land donated to the United States" be omitted, since this refers to a nonrecurring item in the 1939 Act.

## WORK UNDER THIS APPROPRIATION

The work under this appropriation is concerned with the betterment of the economic status of agriculture through conversion of its present crops and new crops into chemicals and other materials needed by industry, and improvement in the quality, recovery, preservation, and use of farm products, by-products, and wastes, employing for these purposes chemical, physical, and biological methods, including the use of and changes produced by yeasts, bacteria, molds, and fungi. This work embraces the conservation and improvement of agricultural raw materials used annually in the production of some \$400,000,000 worth of leather, through the raising of better hides and skins and more efficient methods for preserving these raw products; better methods of tanning; production of more serviceable leathers, and development, as new crops, of domestic tanning materials to supplement our dwindling national supplies; salvaging a yearly production of some 260,000,000 tons of straw, cornstalks, hulls, and similar agricultural by-products by conversion into pulp, paper, pressboard and industrial cellulose and its derivatives; study of the structure and chemistry of lignin in search of industrial outlets for the 40,000,000 tons of lignin now produced annually; development and standardization of biological stains required in the study of plant and animal diseases and in all biological research; production from oils, fats, and waxes of derivatives that may find valuable applications in industry; development of synthetic resins, plastics, and moulded and formed articles from agricultural raw materials; and production of organic chemicals, solvents, and fuel from agricultural crops and by-products, including the economic and technical aspects of making industrial alcohol from renewable sources of raw materials.

## (e) AGRICULTURAL FIRES AND EXPLOSIVE DUSTS

This item, carried under the Bureau of Chemistry and Soils in 1939 at \$40,000, is being consolidated in the 1940 Estimates with the item "Agricultural Engineering Investigations, Bureau of Agricultural Chemistry and Engineering."

## (f) AGRICULTURAL ENGINEERING INVESTIGATIONS

## Appropriation Act, 1939:

Transferred in 1940 Estimates from:

 "Agricultural Fires and Explosive  
 Dusts, Bureau of Chemistry and  
 Soils".....

, \$40,000

 "Agricultural Engineering Investi-  
 gations, Bureau of Agricultural  
 Engineering".....
319,469

Total available, 1939.....

359,469

Budget Estimate, 1940.....

384,469

Increase.....

25,000



## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)	Increase
1. Advice and assistance.....	\$27,700	\$27,700	\$27,700	- -
2. Farm mechanical equipment..	90,337	89,300	89,300	- -
3. Farm buildings and related investigations.....	82,615	82,900	82,900	- -
4. Machinery for processing farm products, Investigations of.....	49,561	76,200	76,200	- -
5. Farm operating efficiency investigations.....	13,422	13,369	13,369	- -
6. Rural electrification investigations.....	- -	30,000	30,000	- -
7. Agricultural fires and explosive dusts.....	48,043	40,000	40,000	- -
8. Plans and service.....	- -	- -	25,000	+\$25,000 (1)
Unobligated balance.....	1,194	- -	- -	- -
Total.....	312,872	359,469	384,469	+25,000

## INCREASE

(1) The increase of \$25,000 in this item for 1940 is to cover the salaries and expenses of a staff of permanent employees of a Division of Plans and Service to prepare plans and specifications for buildings and equipment outside the District of Columbia. For a number of years the Bureau of Agricultural Engineering has been entrusted with the duty of preparing plans and specifications for buildings and technical equipment of the Department outside the District of Columbia. The design of departmental buildings, most of them laboratories, requires special study and close contact with specialists in many branches of agriculture. At present there are being designed a laboratory where the cold storage of fruits and vegetables requires the installation of much experimental equipment, a laboratory for tobacco investigations involving the design of biological and entomological equipment, a plant quarantine station where new and unusual equipment is required for the control of diseases and insects, a number of barns for the study of diseases of animals requiring special equipment to suit the needs of the work to be carried on in each building, a fertilizer research laboratory, and a number of others where the design of buildings and equipment must have special features which can be determined only through constant close contact with those who have special knowledge of the needs and requirements of the various research projects. Because of the necessity for close contact between building designers and research specialists, it is impracticable to have these buildings and their equipment designed by any agency outside the Department.





Since the Bureau is without funds to defray the cost of this work, it has been conducting it on a reimbursable basis. On account of the lack of Department-wide planning for building construction, however, the volume of business has varied greatly from month to month throughout the year. Many of the bureaus postpone much of their construction work until the last quarter of the fiscal year, in order to determine the availability of funds, which results in the necessity for building up a large temporary organization to do work which logically should be spread over the entire fiscal year. Due in part to the emergency relief program, in part to the recently authorized regional laboratories, and in part to the normal building program of the Department, the Bureau now has under way the preparation of plans for buildings and equipment to cost in excess of \$7,680,000. Because of the emergency nature of the work, a large temporary force of employees has been engaged to permit the work to be completed within the allowable time. If the Bureau had had a permanent nucleus of trained personnel available in the past, it would have been possible to have anticipated the building requirements of the Department and to have had the necessary plans prepared and ready for construction. Had it been possible to prepare such plans in advance, more care could have been given to the development of standards, both in design and equipment, and the whole process of providing the Department with the necessary buildings could have been more efficiently carried out.

#### CHANGES IN LANGUAGE

It is recommended that the language of this paragraph be amended to read as follows:

Agricultural engineering investigations: For investigations, experiments, and demonstrations involving the application of engineering principles to agriculture[, independently or in cooperation with Federal, State, county, or other public agencies or with farm bureaus, organizations, or individuals]; for [investigating and reporting upon the utilization of water in farm irrigation and the best methods to apply in practice;] the investigation, development, experimental demonstration, and application of methods for the prevention and control of dust explosions and fires during the harvesting, handling, milling, processing, fumigating, and storing of agricultural products, and of other dust explosions and resulting fires not otherwise provided for, including fires in grain mills and elevators, cotton gins, cotton-oil mills, and other structures; the heating, charring, and ignition of agricultural products; fires on farms and in rural communities and other explosions and fires in connection with farm and agricultural operations; for investigating and reporting upon the different kinds of farm power and appliances; [the flow of farm water in ditches, pipes, and other conduits; the duty, apportionment, and measurement of farm irrigation water; the customs, regulations, and laws effecting farm irrigation; snow surveys and forecasts of farm irrigation water supplies, and the drainage of farms





and of swamps and other wet lands which may be made available for agricultural purposes; for preparing plans for the removal of surplus farm water by drainage; for developing equipment for farm irrigation and drainage; for investigating and reporting] upon farm domestic water supply and [drainage] sewage disposal, upon the design and construction of farm buildings and their appurtenances and of buildings for processing and storing farm products; upon farm power and mechanical farm equipment and rural electrification; upon the engineering problems relating to the processing, transportation, and storage of perishable and other agricultural products; and upon the engineering problems involved in adapting physical characteristics of farm land to the use of modern farm machinery; for investigations of cotton ginning under the Act approved April 19, 1930 (7 U.S.C. 424, 425); for giving expert advice and assistance in agricultural and chemical engineering; for collating, reporting, and illustrating the results of investigations and preparing, publishing, and distributing bulletins, plans, and reports[; including the employment of persons and means in the District of Columbia and elsewhere, and not to exceed \$10,000 for construction of buildings, \$472,400], \$384,469.

The wording proposed for this item is based on that of the appropriation "Agricultural Engineering Investigations", Bureau of Agricultural Engineering, to which has been added the language of the present item in the Bureau of Chemistry and Soils for "Agricultural Fires and Explosive Dusts", incident to the consolidation of these two activities; and from which has been eliminated (a) language relating to irrigation and drainage projects, in view of the transfer of work under those heads to other agencies in the Department, and (b) language authorizing cooperative relationships and the employment of persons and means, which are fully covered in the introductory paragraph to "Salaries and Expenses, Bureau of Agricultural Chemistry and Engineering" and need not be repeated here.

#### WORK UNDER THIS APPROPRIATION

General.--- The work under this appropriation consists chiefly of research on the engineering problems of agriculture. These problems are included in the fields of farm machinery, farm power; rural electrification; farm buildings; agricultural fires and explosive dusts; cotton ginning; fiber flax processing; and the development of farm lands to make possible their most economical and effective utilization. On request, the Bureau also renders engineering service to other bureaus of the Department with respect to the facilities and equipment required in their work.

1. Advice and Assistance.---This item covers such informational activities as the preparation of Farmers' Bulletins and leaflets; preparation and sending out of plans and drawings relating to farm structures; handling of subject-matter correspondence with the public; preparation of motion pictures;



and such other activities as are involved in making available to the public for direct application information regarding the Bureau's work. The project does not include technical bulletins presenting results of research, such bulletins being charged against the particular research project involved.

2. Farm Mechanical Equipment. -- This project covers all the research work done by the Bureau in connection with the use of power and machinery on the farm. It includes projects having for their objects the development of better methods and machines for the production and harvesting of the staple crops grown throughout the country, special emphasis being placed upon studies of the use of equipment in the production of corn, cotton, and sugar beets. These studies have been under way for several years, during which time a number of mechanical devices have been developed which are much more efficient than the machines they replaced. Combinations of planting and cultivating methods with particular types of machines have been developed.

In cotton production the results of six years' work show definitely that the costs can be materially reduced by choosing the right combination of methods and machinery. For example, experimental plots on one soil type showed a higher yield of cotton and better fiber characteristics where a few simple operations were performed, as compared to a lower yield and poorer fiber characteristics where a much more elaborate seed bed was prepared.

Critical studies are being conducted at the Farm Tillage Machinery Laboratory with several types of plows and discs operated at a number of speeds and in several soil types to determine the component forces which go to make up the draft of the tool as well as to note such effects on the soil as pulverization, throw compaction, etc. This will be of material aid in the design of tools better adapted for use at the increasing tractor speeds. Plow shape studies are to be made and correlated with performance. This will aid in the development of suitable shapes for plows to handle so-called push soils as well as those necessary for other difficult soils. Middle busters, sweeps, cultivator shovels, etc., are, in turn, to be studied as time permits so that their design may be improved to better enable them to stand up under the severe conditions of the Southeast.

The work with sugar beets has resulted in the development of a type of machine for thinning beets, which promises to be so successful in reducing the amount of hand labor required as to make it unnecessary to annually import large numbers of laborers from foreign countries for beet production. Beet harvesters have been studied for the past several years until now one type has been evolved which seems to be commercially acceptable. This machine lifts and tops the beets and discharges the beets and tops into separate rows or piles.

A special study is being made of machinery for distributing fertilizer for different crops and under different soil and climate conditions. This project is carried on in cooperation with the Bureau of Plant Industry and 13 State experiment stations. Some experimental machines have been constructed which promise to give excellent results in increased crop production, due to the proper placing and distribution of fertilizer. Farm machinery manufacturers are following these developments and have already incorporated certain features in their machines from which the farmers are deriving much benefit.





Special attention is being given to the development of mechanical means for the control of insect pests, including the corn borer, and insects attacking orchards, vineyards, and truck crops. This work is conducted in cooperation with the Bureau of Entomology and Plant Quarantine and has already resulted in the development of machines and implements, or attachments to the same, which have been very effective in destroying these insect pests. Various types of equipment have been designed for applying insecticides for the control of harmful or injurious insects and various types of spraying equipment have been studied in connection with this work. One type of vapor spraying seems especially promising.

Under the work project "Utilization and Cost of Farm Power and Machinery" studies on the harvesting of pyrethrum are to be continued and experiments conducted on the artificial drying of the flowers of the plant to permit easier handling and safer storing. Studies on sweetpotato planting and harvesting are under way at the Starch Plant at Laurel, Miss. Because of the advent of the one-plow tractor and the changes brought about by the increasing use of rubber tires on both tractors and field equipment, studies are to be undertaken on farm power relative to these new developments.

3. Farm Buildings and Related Investigations.-- This work includes investigations designed to develop better and more efficient farm structures for all uses. Surveys in 1934 indicated that one-sixth of all farm houses had deteriorated to a point where they should be replaced by new buildings and that the needed expenditures for bringing the remaining five-sixths to a desirable standard would run into billions of dollars. Observations during the past year and detailed surveys of small districts indicate that little progress in farm building rehabilitation has yet been made and that a tremendous accumulated volume of repair and rebuilding is required. To assist farmers to determine the value of various kinds of improvements the Wisconsin Agricultural Experiment Station and this Bureau are measuring conditions which affect the use, comfort, and lighting of typical farm homes and are studying the effect of improvements. Remodeling of the first two homes studied has been completed by the owners, and measurements are being made in the improved houses to determine the benefits that have been obtained. Similar work on other types of houses is in progress. In Georgia, where high temperatures affect the comfort and well-being of persons, animals, and stored products, methods of controlling temperatures in buildings by structural and other simple means are being investigated by the University of Georgia and this Bureau. Studies of water supply and sewage disposal and of heating and cooking equipment for farm use are also being conducted. A survey of farm fences, showing the need for a large amount of fence repairs and rebuilding, has recently been made, and a bulletin giving the most up-to-date information on this subject is being prepared.

Studies on the storage of farm products deal with various crops. Potato storage is being studied in Maine and Michigan; corn storage in Iowa and Illinois; apple storage in Virginia; and the design of silos in Maryland and New Jersey. The work also includes laboratory measurements of the heat developed by stored products and studies of the transportation of fruits and vegetables and of the cooling of milk on farms.

To make generally available to farmers the results of research work dealing with farm structures, the 12 Northeastern State agricultural colleges and this Bureau cooperated in the preparation of a catalogue of more than 100 plans, selected for special merit, for the use of farmers, extension workers,





lumber dealers, and rural contractors and builders. The plans illustrated are made available through the extension services of the cooperating colleges. A similar service for the eleven far Western States is now in preparation and one for the Southern States is contemplated. The Middle West is already served by the Mid-West plan service inaugurated in 1933.

4. Investigations of Machinery for Processing Farm Products.-- The principal work under this project at present consists of experimental laboratory studies designed to improve the equipment and methods employed in ginning cotton. Under a special appropriation heretofore made by Congress a cotton ginning laboratory has been built at Stoneville, Miss., and experimental ginning is in progress. Preliminary investigations have indicated certain parts of the process that apparently should be studied first, and these are now being investigated. To secure the benefits that can reasonably be expected from this project it will be necessary to continue the work over a period of years. The project is being conducted in cooperation with the Agricultural Marketing Service. A cotton drier developed in connection with this project has been placed in production by several manufacturers and is proving to be both efficient and economical.

Observations made in Oregon, where fiber flax production is concentrated in this country, indicate definite needs for improvements in methods and machinery for harvesting and processing this crop. The harvesting, deseeding, retting, and scutching of fiber flax in the United States is patterned after European methods, which involve much hand labor. The retting and scutching operations are similar to the ginning of cotton in that they are semimanufacturing processes for getting the fiber in condition for market. The retting and scutching mills are located where the flax is produced and, in Oregon, are farm cooperatives. Under an appropriation made by Congress investigational work has been initiated on this problem. Preliminary investigations indicate the need for reduction in cost of harvesting and processing and the development of processing machinery which will not impair the natural qualities of the fiber. It is believed that a number of improvements can be made along these lines of benefit to farmers.

5. Farm Operating Efficiency Investigations.-- This project has for its object the improvement of the operating efficiency of farms. It is evident that the size and shape of the fields, their condition as regards wet spots, steep hillsides, and stumps and stones, and the kind and amount of crops raised thereon must be considered in determining the type and size of farm machinery which should be used. It is necessary that the individual farm be treated as a unit, with all the interlocking elements of the farm business in proper relationship. In order to secure such a balanced farming program, this project is being carried on in cooperation with farm management authorities. The investigations have involved the making of complete surveys of a number of farms which are typical of a section or State. A complete farm program is then prepared and the benefits which will be received by the farmer are determined after the improvements are made. To illustrate the necessity for this project preliminary surveys have shown that on 18 farms in northern Minnesota, containing a total of 181 fields, the average size of field was 4 acres; and that on 10 farms in one county in North Carolina there were 218 fields having an average size of 2.03 acres. It is obvious that modern equipment can not be used and low-cost methods of production employed under these conditions.



It has been found that by comparatively inexpensive rearrangement the average size of fields on the farms studied could be more than doubled. This project is considered to have great possibilities from the standpoint of effective utilization of land now under cultivation.

6. Rural Electrification Investigations.--Work on this project was started in July, 1938, under funds provided in the 1939 Agricultural Appropriation Act. The purpose of this work is to make the widespread and rapidly increasing uses of electricity on farms profitable and safe through suitable adaptations to farm operations and processes, and to determine principles to be observed in the design of electrical equipment for practical use on farms. The loans being made under the Rural Electrification Act and the additional purchase of hundreds of millions of dollars worth of electrical equipment, wiring, and electric current by farmers will bring great benefits only if the farmers are able to utilize electricity for income as well as for living purposes.

It is planned to carry on the following work so far as time and funds will permit:

(1) Survey and collate experiment station data which are immediately available and have value for general national use for (a) poultry and egg production; (b) dairy and livestock operations; and (c) orchard and garden enterprises. Analysis of the progress of prior and current investigations will serve as a basis for determining what part of the information gathered may be approved for publication and what the course of further investigations should be.

(2) Conduct field and laboratory investigations and experiments to develop uses for electricity which will increase cash income or production of goods for home consumption, or effect savings over the cost of facilities replaced by the electric service, or result in a combination of these benefits, in addition to raising the level of living of farm families.

(3) Begin fundamental agricultural engineering studies of electrical phenomena which relate to agricultural science. These studies are an approach to field uses of electricity in mobile or tractive farm equipment, and include investigations of reactions of plant and animal life to electrical or radiation influences for beneficial as well as pest control purposes.

7. Agricultural Fires and Explosive Dusts.--Work under this project includes studies on dust explosions and explosion hazards in grain handling operations and in industrial plants handling products of agricultural origin; experimental chemical research and development work on the prevention of dust explosions and resulting fires; and the practical application of the results of this research. Special attention is being given to the development of safety codes for dust-explosion prevention. Chemical and engineering research is also conducted on the causes of self-heating of agricultural products and on the development of equipment and methods for the prevention and control of farm fires. Active cooperation is carried on with farm organizations, agricultural experiment stations, industrial companies, insurance





organizations. State commissions, fire-prevention associations, safety organizations, and other interested agencies in the practical application of the results of this research and in the preparation of protective measures. These investigations are directly concerned with saving human life and property, and the research work is directly associated with the development of safety measures in the more efficient utilization of agricultural products. Increased industrial operations and the utilization of by-products and waste materials resulting in the production and accumulation of large quantities of explosive dusts have greatly increased the hazards. With practically every new development for the utilization of agricultural products it is necessary to work out new methods for protection from dust explosions and agricultural fires.

(g) NAVAL STORES INVESTIGATIONS

Appropriation Act, 1939

(Bureau of Chemistry and Soils).... \$79,400

Budget Estimate, 1940..... 79,400

PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
Naval stores investigations:			
(a) Naval stores production, processes, and equipment...	\$42,970	\$39,906	\$39,906
(b) Composition, properties, components, and derivatives of naval stores.....	17,784	21,241	21,241
(c) Uses, handling, and transportation of naval stores..	19,709	18,253	18,253
Unobligated balance.....	937	- -	- -
Total appropriation.....	81,400	79,400	79,400

WORK UNDER THIS APPROPRIATION

The purpose of this work is to improve agricultural-chemical-technological practices, processes, and equipment for the production of turpentine, rosin, and related products, so as to prevent deterioration and waste, reduce costs of production, and obtain products of better quality; to carry on fundamental studies of the chemical composition and properties of turpentine and rosin; to develop processes and equipment for improving established naval stores products; and to expand present and develop new uses for oleoresins, turpentines, and rosins, needed to absorb current production and the inevitable increase that will occur within a few years.





The average annual value of naval stores is approximately \$40,000,000, with an annual average production of approximately 650,000 50-gallon casks of turpentine and 2,500,000 500-pound barrels of rosin, with an assured potential production through voluntary regrowth of pine timber of a much larger volume. Naval stores are important day-to-day cash crops of the South, affording a living to more than 300,000 persons in an area 70 percent of which is devoted to the growth of forests and provides the major business of large areas in the South. Over 20,000 farmers produce and sell the crude turpentine gum and nearly 2,000 producers operate stills to separate the gum into turpentine and rosin. It is only by reducing costs of production and by increasing consumption through new uses of naval stores that this large number of people may be afforded a living. The rational use of land, through land-use adjustment, is a major problem in Southern agriculture. These investigations on naval stores bring greater returns to the turpentine farmer and have a direct bearing on the economic maintenance of the pine forests of the South, thus also helping to keep submarginal lands out of other agricultural crops for which they are neither suited nor needed.

#### (h) SOIL SURVEY

This item, carried under the Bureau of Chemistry and Soils in 1939 at \$298,708, is transferred unchanged in the 1940 Estimates and set up as subappropriation under "Salaries and Expenses, Bureau of Plant Industry."

#### (i) SOIL CHEMICAL AND PHYSICAL INVESTIGATIONS

This item, carried under the Bureau of Chemistry and Soils in 1939 at \$26,700, is transferred unchanged in the 1940 Estimates and set up as a subappropriation under "Salaries and Expenses, Bureau of Plant Industry."

#### (j) FERTILIZER INVESTIGATIONS

Appropriation Act, 1939 (Bureau of	
Chemistry and Soils).....	\$263,800
Budget Estimate, 1940.....	<u>263,800</u>



## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
<u>Fertilizer Investigations:</u>			
(a) Mixed fertilizers.....	\$58,746	\$57,000	\$57,000
(b) Potash fertilizers.....	31,000	31,000	31,000
(c) Phosphate fertilizers.....	26,015	26,000	26,000
(d) Nitrogen fertilizer production.....	34,370	34,300	34,300
(e) Catalyst investigations.....	31,440	30,000	30,000
(f) Biochemical nitrogen- fixation.....	29,880	29,800	29,800
(g) Fundamental physical and chem- ical fertilizer investigations.	56,690	55,700	55,700
Unobligated balance.....	1,454	- -	- -
Total appropriation.....	269,595	263,800	263,800

## WORK UNDER THIS APPROPRIATION

Work under this appropriation consists of investigations on the chemistry, physics, technology, and production of the fertilizer ingredients nitrogen, phosphoric acid, potash, and soil amendments such as lime, sulphur, magnesium, and manganese. The work has for its purpose the development of methods for the utilization of our many natural resources and by-products in order to give the farmers the greatest value for the money they invest in plant food. The farmers of the United States normally use from 7,000,000 to 8,000,000 tons of commercial fertilizer each year at a cost of approximately \$240,000,000. The research is directed toward the development of more efficient and economical processes for the manufacture of potassium nitrate, potassium sulphate, urea, etc.; production of new fertilizer compounds, such as calcined phosphate, organic phosphates, chlorophosphate, calcium metaphosphate, potassium metaphosphate, ammoniated peat, etc.; improvement in the quality of fertilizer materials and mixtures to give maximum beneficial effects to crops and soils, and improvements in their physical condition to facilitate handling and distribution in the field; increasing the plant-food content of fertilizers and eliminating fillers to reduce handling, bagging, storage, and transportation costs; and utilization of new sources of raw materials, or low-grade materials formerly wasted, and of by-products from the industries. The solution of these main problems also calls for the use of many fundamental chemical and physical data which can be obtained only by a comprehensive research program. The development of suitable fertilizers and methods for their more effective use as plant foods is of vital importance in such national problems as soil erosion and flood control, the proper utilization of land, rehabilitation, and the conversion of large acreages of unproductive land into grasslands and forests.



## (k) IN ALL, SALARIES AND EXPENSES

Change in Language

It is recommended that the language of this paragraph be amended by substituting for the word "Total" the following:

"In all, salaries and expenses, to be accounted for as one fund"

For explanation of this change see general note in these Justifications under Office of Experiment Stations, page 54.

SUPPLEMENTAL FUNDS  
(Complete bureau statement)

Projects	Obligated, 1938	Estimated obligations, 1939	Estimated obligations, 1940
<u>Special Research Fund, Department of Agriculture:</u> For special research projects in the fields of chemistry and engineering.....	\$205,155	\$223,540	\$197,840
<u>Conservation and Use of Agricultural Land Resources (New Uses and Markets for Farm Commodities, Regional Laboratories, and Surveys):</u> For four regional research laboratories, to develop new uses and markets for farm commodities, authorized by Sec. 202 of the Agricultural Adjustment Act of 1938 (includes 1939 survey).....	- -	3,951,366	3,980,000
<u>Administration of Agricultural Adjustment Act of 1938, Department of Agriculture:</u> For assistance in survey to determine location of four regional research laboratories authorized by Sec. 202 of Agricultural Adjustment Act of 1938.....	11,529	- -	- -
<u>Public Works Administration (Emergency Appropriation Act, 1935):</u> Construction and equipment of farm tillage experimental laboratory, Auburn, Ala. (completion of work begun in 1934).....	102	- -	- -
<u>Public Works Administration, Act of 1938:</u> Construction of laboratory and completion and repair of Government dwellings and laboratory buildings at Stoneville, Miss...	- -	15,100	- -





## SUPPLEMENTAL FUNDS - Continued.

Projects	Obligated, 1938	Estimated obligations 1939	Estimated obligations 1940
<u>Emergency Relief Appropriation Act of 1938:</u>			
For expenses of preparing plans and specifications in connection with rural rehabilitation.....	- -	\$10,000	- -
Construction of laboratory and completion and repair of Government dwellings and laboratory buildings at Stoneville, Miss.	- -	3,900	- -
For administrative expenses in connection with physical improvements at Stoneville, Miss.....	- -	200	- -
Total, Emergency Relief Appropriation Act of 1938.....	- -	14,100	- -
<u>Working Fund, Agriculture (War, Flood Control, Mississippi River and Tributaries): For land appraisal work.....</u>	55,455	61,612	60,000
<u>Working Fund, Agriculture (Maintenance and Improvement of Existing River and Harbor Works): For land appraisal work.....</u>	8,466	20,534	20,000
<u>Working Fund, Agriculture (War, Flood Control, General): For land appraisal work.....</u>	- -	120,000	120,000
<u>Transfers (3) from State Department (a)--for investigations to determine damages to crops and forests in State of Washington by fumes from smelter at Trail, British Columbia....</u>	15,453	9,475	- -
Total, Supplemental Funds (Direct Allotments).....	296,160	4,415,727	4,377,840

(a) See "Agricultural Chemical Investigations."



## PASSENGER-CARRYING VEHICLES

The authorization of \$3,725 for the purchase of passenger-carrying vehicles for the Bureau of Agricultural Chemistry and Engineering will permit the needed replacement of 6 vehicles at a net average cost of \$621 each when exchange allowances are taken into account. Before the end of the 1940 fiscal year the 6 cars to be replaced will all be 5 years old or more. These machines have been operated under practically all conditions of use, ranging from city streets to extremely rough forest trails. Their average performance as of June 30, 1938, was approximately 40,000 miles and it is estimated that their average mileage will be approximately 55,000 miles before they are actually turned in. In the experience of the Bureau, cars will not operate efficiently or economically beyond this mileage, and it appears to be distinctly in the best interests of the work to turn them in during the fiscal year 1940, as herein provided.

The automobile is practically indispensable for the proper conduct of the Bureau's work, since a great many of the points visited are in remote areas where public transportation facilities are very limited and in many cases not at all available. The Bureau has many experimental projects located on privately-owned farms, and it is sometimes necessary that employees go from farm to farm in checking up on these projects. Public conveyances are not available for such trips, but an automobile makes it possible to visit many farms in a single day.

The purchase and operation of Government-owned cars has been found from experience to be more economical than either the hiring of commercial automobiles or the use of personally-owned cars of employees on a mileage basis. Records kept over a series of years indicate that the average per-mile cost of a Government-owned car, figuring in the purchase price and all operating and maintenance expenses up to the time it is turned in as no longer serviceable and then deducting the exchange allowance, is less than 3 cents. On the other hand, the cost of hiring personally-owned vehicles averages about 5 cents per mile and for hiring commercial cars from 10 to 15 cents per mile.



## BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

## (a) GENERAL ADMINISTRATIVE EXPENSES

Appropriation Act, 1939.....\$166,280  
 Budget Estimate, 1940..... 166,280

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
General administration and business service.....	\$165,694	\$166,280	\$166,280
Unobligated balance.....	586	- -	- -
Total appropriation.....	166,280	166,280	166,280

## WORK UNDER THIS APPROPRIATION

The funds provided under this appropriation are used for general administrative purposes, including the determination of policies; general administrative supervision of all departmental and field activities; business operations; approval and preparation for publication of manuscripts concerned with the scientific, technical, and other activities of the Bureau; preparation and distribution of general information on control of insect pests; maintenance of a comprehensive library of entomological literature and the preparation of bibliographies on entomological subjects; and the handling of general information relating to Federal quarantines and preparation of cases on quarantine violations.

## EMERGENCY FUNDS

Projects	Obligated, 1938	Estimated obligations, 1939
Emergency Relief Appropriation Act of 1936:		
General administrative expenses.....	\$47,141	- -
Emergency Relief Appropriation Act of 1937:		
General administrative expenses.....	115,871	- -
Emergency Relief Appropriation Act of 1938:		
General administrative expenses.....	- -	\$175,000
Total, Emergency Funds.....	163,012	175,000

These funds are used for administration of emergency work relief projects set forth under the various headings in the following notes and summarized at the end hereof.





## (b) FRUIT INSECTS

Appropriation Act, 1939.....\$428,600  
 Budget Estimate, 1940..... 428,600

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
1. Investigations on apple and pear insects.....	\$89,425	\$90,670	\$90,670
2. Investigations on peach insects.....	51,254	52,869	52,869
3. Investigations on grape insects.....	9,730	10,995	10,995
4. Investigations on nut insects.....	25,245	26,500	26,500
5. Investigations on insects attacking dried fruits.....	15,410	16,002	16,002
6. Investigations on citrus and other subtropical fruit insects.....	39,975	41,020	41,020
7. Investigations on fruit flies which are potential pests in continental United States.....	71,886	75,411	75,411
8. Investigations on the insecticidal value of oils.....	4,265	5,120	5,120
9. Investigations on Japanese and Asiatic beetles.....	107,285	110,013	110,013
Unobligated balance.....	14,125	- -	- -
Total appropriation.....	428,600	428,600	428,600

## WORK UNDER THIS APPROPRIATION

General.-- This appropriation provides for investigations on insects affecting fruits, fruit trees, nuts, grapes, and those small fruits which have their seeds internally, such as blueberries and cranberries, and the development of measures for their control. The work also includes investigations on the Japanese and Asiatic beetles and fruit flies--such as the Mediterranean fruit fly and the Mexican fruit fly. The studies on insects other than fruit flies native to other countries are directed by the Division of Fruit Insect Investi-



gations which is headquartered in Washington. Field laboratories at which investigations are carried on and where growers may obtain information as to the control of pests are maintained in the principal fruit-growing regions of the country. The investigations on fruit flies native to other countries are directed by the Division of Fruit Fly Investigations with headquarters in Mexico City, Mexico. Field headquarters for these studies are maintained in Mexico, Hawaii, Puerto Rico, and the Canal Zone.

1. Investigations on Apple and Pear Insects.--The funds provided under this project are used almost exclusively for investigations to develop effective and economical means of controlling numerous pests of apples. The standard control for the codling moth leaves harmful insecticidal residues on the harvested fruit and presents such a critical situation and such a difficult problem that funds under this project have, during the past year, been devoted very largely to investigations on the codling moth. The use of the standard insecticide, arsenate of lead, for the control of the codling moth leaves residues of lead and arsenic which may be injurious to human health. This condition is corrected in part by washing the fruit in dilute hydrochloric acid or other solvents to remove excessive residue, but this operation is costly and cannot be economically applied throughout the entire country. Effective substitutes for the method of control now recommended are needed at as early a date as practicable. The investigations now under way include laboratory and field tests on new insecticides (one of which, a nicotine-bentonite mixture, shows encouraging possibilities), control by traps and baits, and the use of cultural practices and natural enemies.

A small part of the funds under this project is used for incidental investigations on such pests as the apple maggot, the tarnished plant bug, and the pear thrips. The losses caused by the pear thrips during the past few years have been especially heavy, and cooperative studies have been begun with the Oregon Agricultural Experiment Station.

2. Peach Insect Investigations.--Funds allotted to this project are used for investigations on the various insects attacking peaches, such as the Oriental fruit moth, plum curculio, San Jose scale, and the peach-tree borer, and for investigations to determine the relation of insects to peach diseases, particularly phony peach and peach mosaic.

In the absence of effective insecticidal control for the Oriental fruit moth, emphasis is being placed on the control of this pest by natural enemies. Certain native parasites have proven to be effective and these are being colonized in areas recently infested by the moth. In addition to colonization of native parasites, special attention is devoted to the importation and colonization of parasites from Japan. Several very promising parasites have been imported from the Orient and are being propagated at the laboratory at Moorestown, New Jersey, for liberation in infested areas. In some sections parasites have become sufficiently well established to bring about very appreciable control. Further work in this field should be of material benefit to other sections of the extensive area now infested by this pest, as studies already made show a very rapid rate of dispersion of several of the introduced species.



Investigations on the plum curculio and peach-tree borer are being carried on at the laboratory in Fort Valley, Georgia. Special attention is being directed toward the development of measures for control which will not require the use of lead arsenate throughout the season. When so used in areas where two broods of the curculio occur, objectionable residues may remain on the fruit after harvest, and no method for its removal is available. Studies on the peach-tree borer have for some time been under way in Georgia. They have recently been extended to southern Illinois and western New York. In addition to work on the control of this insect in orchards, special attention is given to determine its relationship to the phony peach disease and to develop means for disinfecting nursery stock so as to eliminate infestation by the borer and thus reduce the danger of its carrying the disease into uninfested regions. The residual effect of lime sulphur as an aid in control of the San Jose scale has been studied.

Certain diseases of peach, particularly phony peach and peach mosaic, may be carried by insects. Intensive studies to determine the relations which insects may have to the spread of these diseases are under way. These include studies of insect conditions in orchard areas and investigations on disease transmission.

3. Grape Insect Investigations.--The major problem being studied under this project is the development of effective means for controlling the grape berry moth without causing objectionable spray residues. Studies are under way to determine the practicability of modifying cultural practices so as to keep down heavy infestations, thus reducing the number of spray applications necessary. Investigations on insecticides other than those which leave objectionable spray residues are also under way. Many of those tested remove the "bloom" of the grape desired especially for table varieties. The impracticability of washing grapes increases the difficulty of solving this problem. Changes in materials used in sprays or in the spray schedule also effect the control of certain other pests, such as the grape root worm, the rose chafer, and the leaf roller, which have heretofore been held under control by sprays applied for the grape berry moth. Small amounts are used for studies on two of the more important of these.

4. Nut Insect Investigations.--This project provides for investigations on insects attacking nuts and the development of methods for their control. These investigations are concerned largely with insects attacking pecans, including such pests as the nut case bearer, shuckworm, pecan phylloxera, black pecan aphid, and an obscure scale. Effective controls for these pests are not available under all conditions existing throughout the area where pecans are produced. The controls applied in some sections are unsuitable in others. In some sections the use of oil sprays for the control of scale has caused considerable tree injury not experienced in other localities. The investigations on pecan insects are carried on at three field laboratories. The one at Albany, Ga., is concerned mostly with investigations on the shuckworm; the one at Brownwood, Tex., is studying certain case bearers and the black pecan aphid, the obscure scale, phylloxera, and June beetle; and the one at Monticello, Fla., which is cooperative with the State, is giving attention to the nut case bearer. Studies begun in Oregon during the past fiscal year, on insects attacking filberts, are being intensified to deal effectively with those pests which preliminary work has shown to be most serious.





5. Dried Fruit Insect Investigations.--The work under this project is concerned with insects attacking dried fruits and the determination of methods for their control. Many of the insect pests found in dried fruit occur in and infest the fruit in the orchard as well as when it is being dried and stored. These activities are largely centered in the laboratory at Fresno, Calif., and many of them are carried on in cooperation with the University of California and The Dried Fruit Association of California.

6. Investigations on Citrus and Other Subtropical Fruit Insects.--This project is concerned with investigations on insects attacking citrus and other subtropical fruits and the development of measures for their control. These studies are carried on at field laboratories in Florida and California. In California particular attention is devoted to the development of effective methods of controlling the California red scale and citrus thrips. Methods for control of the red scale previously worked out have been found to be ineffective in certain sections where the insect seems to be resistant to the standard methods of control by fumigation, and, despite the development of improved methods, there remains need for further work in this field. In this same general section the control of the citrus thrips by the use of sulphur is not fully effective. The method and time of application of various controls require further study. Work in California is carried on in cooperation with the California Citrus Experiment Station and coordinated with that done by other agencies.

In Florida special studies are being conducted in cooperation with the Bureau of Plant Industry and the Bureau of Chemistry and Engineering on the effect of certain insecticides, particularly lime sulphur sprays, on citrus trees and fruits. The use of sulphur for the control of rust mites and certain scale insects is also being studied in Florida. Special emphasis is being placed on the timing of applications and the relation of the dosages, including determination of the period during which sulphur may remain on the foliage in sufficient amounts to be effective. Some attention is also directed at the development of methods of control for papaya fly and white flies and scales which attack a number of kinds of subtropical fruit trees.

7. Investigations on Fruit Flies Which Are Potential Pests in Continental United States.--This project is concerned with investigations on the biology and methods of controlling certain important fruit flies in their native regions in order to provide information which will aid in preventing them from entering the United States and the development of methods for their control if they should become established in the United States. The investigations are headquartered in Mexico City, Mexico; Honolulu, T. H.; Balboa, Canal Zone; and Mayaguez, Puerto Rico. In Mexico City, which has general direction of the entire project, special attention is directed to the Mexican fruit fly and certain related species. Particular attention is now being given to developing attractants that can be used in traps to detect the presence of the fly and sprays to aid in its control. Such information is particularly needed in connection with the work in the Lower Rio Grande Valley in Texas. Work is also being done on the relation of climatic factors to the insect. The work in Hawaii is concerned with the Mediterranean fruit fly and the melon fly. Special attention is now being directed to the development



of bait sprays to be used in controlling the adults, development of attractants that may be used in traps, and determination of more effective methods for the disposal of waste or culled fruit. Attention is also being given to fumigation studies. The work in the Canal Zone is concerned with studies on the life history, habits, and hosts of numerous species of fruit flies which occur there and which are a menace to the fruit cultures of the United States. In Puerto Rico experiments are under way to determine more effective methods of combating the two kinds of fruit flies which occur there and previously referred to as the West Indian fruit fly, particular attention being directed to methods of treating fruit to kill any living forms it may contain.

8. Investigations of the Insecticidal Value of Oils.--This project provides for investigations to develop oil sprays for the control of insect pests on fruit trees. Basic information is needed to determine the kinds of oils that may be safely used for this purpose. Attention is now directed to the use of oil sprays to which other toxic substances have been added to kill citrus red scale and the use of such materials to supplement fumigants now used to combat this pest. These studies are conducted at the laboratory at Whittier, California.

9. Investigations on Japanese and Asiatic Beetles.--This project provides for investigations to determine methods of control for three introduced pests of major importance--the Japanese beetle, Asiatic garden beetle, and Oriental beetle. The work under way is concerned with the development of more effective methods of control of these pests by the use of insecticides and by other artificial means, the introduction and colonization of parasites which may aid in reducing their numbers, and the determination of methods of treating plants or plant products which may carry this pest into uninfested regions. These investigations include work on the adults and larvae, as these beetles are injurious as grubs and adults. These activities are headquartered at the laboratory at Moorestown, New Jersey, but sublaboratories are maintained in certain outlying sections for the study of the insect in areas where it is becoming established.

#### SUPPLEMENTAL FUNDS

Projects	: Obligated, : 1938	: Estimated : obligations, : 1939
Agricultural Adjustment Administration	:	:
(Payments for Agricultural Adjustment):	:	:
Fruit fly control in Hawaii (in lieu of sugar tax funds).....	\$4,202	\$798



## (c) JAPANESE BEETLE CONTROL

Appropriation Act, 1939.....\$395,000  
 Budget Estimate, 1940..... 395,000

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
1. Japanese beetle control operations:			
(a) Supervision of nurseries and greenhouses for Japanese beetle control.....	\$159,031	\$162,900	\$162,900
(b) Scouting adjacent to nurseries and greenhouses for Japanese beetle control.....	29,589	29,600	29,600
(c) Trapping to determine distribution of the Japanese beetle.....	87,637	88,000	88,000
(d) Soil treatment and trapping in isolated areas to aid in preventing spread of the Japanese beetle.....	13,204	9,000	9,000
(e) Farm products inspection for Japanese beetle control.....	35,922	36,000	36,000
(f) Vehicular inspection for Japanese beetle control.....	50,465	51,000	51,000
(g) Transit inspection for Japanese beetle control.....	6,979	7,000	7,000
(h) Tests of treatment required for Japanese beetle control.....	11,176	11,500	11,500
Transfer to "Pink bollworm control", Bureau of Entomology and Plant Quarantine.....	25,000	- -	- -
Unobligated balance.....	5,997	- -	- -
Total appropriation.....	425,000	395,000	395,000





## WORK UNDER THIS APPROPRIATION

This appropriation provides for control and prevention of spread of the Japanese beetle, including determination of spread, enforcement of quarantine regulations to prevent and retard spread into new localities, and inspection and certification of nursery stock and other materials the movement of which is regulated under Federal and State quarantines. In cooperation with the State and local agencies, control measures are conducted to suppress the beetle at points considerable distances from the generally infested area to prevent developing new centers of spread. The work involves a number of activities which are briefly described as follows:

The Japanese beetle occurs in the largest nursery sections of the United States. Nursery products produced in the infested area are shipped to every State in the United States. To prevent them from carrying the beetle to uninfested sections all those moving from the quarantined area must be handled or treated in a manner to eliminate risk of spreading of infestation. Products produced or handled as required by quarantine regulations and after prescribed inspection are certified and may move freely and without risk of carrying the pest into new sections. The requirements provided as a basis of certification vary with the class of nursery stock and the degree of infestation in or adjacent to the nursery or greenhouse in which it is produced. The adequate enforcement of these requirements forms the sole protection against the distribution of the Japanese beetle by these materials. Nursery stock is one agent by which the beetle may easily be transported into new sections. It is believed that this pest entered the United States in soil around the roots of nursery stock. If our uninfested regions are to be protected from infestation, it is important that adequate provision be made for inspection and certification of similar material moving to points outside the quarantined area. There are more than 2,300 nurseries and greenhouses in the regulated area and hundreds of thousands of plants are offered for shipment annually.

Nurseries and greenhouses in the quarantined area are classified on the basis of presence or absence of beetles on or adjacent to the individual premises. The requirements for certification of the two classes of establishments differ. A very essential part of the enforcement of quarantines for the protection of uninfested regions is the classification of these establishments, which can be determined only by scouting rather than by the use of traps. Inspection work of this type must be done with great care to avoid erroneous classification of establishments so as not to work undue hardship on the producer and at the same time give adequate safeguards against products that may move from their establishments.



It is essential to the effort to retard the spread of the Japanese beetle that we have accurate information as to the possible presence of outlying infestations. To secure this information traps are operated to determine the possible presence and relative abundance of the beetle. The traps are operated in selected localities where infestation is light and at places outside the known infested area, particularly along main highways or at important railroad centers. The prompt location of incipient outlying infestations can be accomplished only by this type of work, and any curtailment will, as in the case of St. Louis, Missouri, delay location of centers of infestation for a number of seasons. Trapping operations begin in the Southern States early in June and at later dates in the more northern sections.

The operation of a large number of traps to aid in the reduction of beetles is an important part of control operations carried on at certain isolated centers of infestation. St. Louis, Mo., and Erie, Pa., are examples where trapping for control is carried on. In outlying areas where it is practical to locate sections where there is good reason to believe grubs occur in the soil, the application of certain treatments, such as arsenate of lead, will materially aid in reducing the number of beetles that appear next season. Work of this type is carried on in cooperation with the State or local agencies.

Many types of farm products, particularly fruits and vegetables, may carry adults of the Japanese beetle into uninfested regions. Beans, apples, peaches, and berries are produced in considerable quantities in the infested area and are products which must be handled under proper safeguard before they are shipped into the uninfested regions. The type of handling required prior to certification of various classes of products varies with the nature of the product. Various types of berries are fumigated and peaches are inspected, while beans are run through a mechanical device to shake off the beetles. Provision is also made that products inspected and certified be subsequently handled in a manner to prevent reinfestation. Products of this type are perishable and the force of inspectors must be adequate to supervise the required treatment or inspect them promptly and effectively, so they can move in as nearly a normal manner as possible and still eliminate the risk of spreading the beetle.

To assure that products likely to carry the beetle are being moved only in accordance with the requirements of the quarantine, road stations are maintained on various highways leading from the quarantined area.

Inspectors are stationed at certain important transportation centers within the infested area during part of the season to examine products regulated by the quarantine in order to assure that common carriers comply with the regulations of the Japanese beetle quarantine regarding the movement of products that may carry this pest.



It is necessary to know that the methods of treatment devised under certain limited conditions are effective when applied commercially under different conditions. To determine the fitness or inadequacy of various treatments authorized as a basis of certifying products regulated under quarantine, it is necessary to make repeated tests. Without this repeated checking, possible weaknesses under prevailing conditions might not be detected and thus shipment of living beetles in certified articles might be unknowingly permitted.

(d) MEXICAN FRUIT FLY CONTROL

Appropriation Act, 1939.....\$160,460  
 Budget Estimate, 1940.....160,460

PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
1. Mexican fruit fly control operations:			
(a) Grove and packing-house inspection and certification for Mexican fruit-fly control.....	\$117,397	\$128,660	\$128,660
(b) Spraying and control of Mexican fruit fly in Texas.....	20,571	21,800	21,800
(c) Spraying and control of Mexican fruit fly in Mexico.....	5,000	5,000	5,000
(d) Vehicular inspection for Mexican fruit-fly control.....	5,000	5,000	5,000
Unobligated balance.....	12,492	- - -	- - -
Total appropriation.....	160,460	160,460	160,460

WORK UNDER THIS APPROPRIATION

This appropriation provides for control and regulatory operation directed against the Mexican fruit fly to protect the fruit-growing areas in the United States from danger of infestation by this insect, which is known to attack many different kinds of fruits. These include the enforcement of the domestic quarantine on account of this pest, the supervision of control operations in the quarantined area in the Lower Rio Grande Valley of Texas, and cooperation with the Mexican Government and local Mexican authorities to suppress the infestation of this pest as much as possible in areas in Mexico adjacent to the regulated area of Texas to reduce danger of reinfestation from that source.

The work carried out under this item involves a number of different activities which are briefly discussed in the following paragraphs:





The Federal domestic quarantine on account of the Mexican fruit fly requires that the growers, packing plants, and shippers comply with certain practices before fruit will be certified for moving to points outside the regulated area. The compliance with these practices reduces or eliminates the opportunity of spread of the pest through the movement of fruit, thus giving protection to the uninfested sections. The certification of fruit moved from the area assures compliance with the quarantine requirements and permits the movement of fruit from regulated areas to markets throughout the United States. The quarantine provides for the maintenance during the summer of a non-host period when fruits which may be attacked by the fruit fly do not remain on the trees. It provides for removal and the destruction by approved practices of culls and dropped fruits, for the maintaining of sanitary requirements in packing houses and similar places where fruit is handled, for the disposal by approved practices of fruit from areas where infestation may be detected, and for the sterilization of fruit when this is required as a condition of movement. Sterilization is becoming a factor of increasing importance and as a result of the satisfactory results secured last season, a number of shippers are installing sterilization equipment as a purely voluntary matter. Citrus is the only fruit commercially produced in the regulated area. There are more than 6,000,000 trees set out in grove formation that have already reached the bearing age. The inspection of these trees to locate possible presence of the fruit fly and inspections to see that the growers and packing houses are maintained to comply with the quarantine regulations require a large amount of labor. To handle the work of inspection and certification of products in the regulated area more effectively the area is divided into 12 districts.

To detect the possible presence of the fruit fly, traps are operated a considerable portion of the year. If adult flies are found a poison spray on which the adults feed may be applied in the groves so the adults will be killed prior to laying of eggs. To be fully effective the proper application of this spray is essential and the work must be closely supervised.

No commercial fruit is produced in Mexico adjacent to the Lower Rio Grande Valley in Texas where infestations of Mexican fruit fly have been found. The only fruit trees in adjacent Mexican territory are those in dooryards grown largely for shade or ornamental purposes. Considerable quantities of fruit, however, are shipped from the interior of Mexico into this area for local consumption. Much of this fruit is infested and is a source of infestation of the fruit produced on dooryard and ornamental trees. The presence of this fruit and infestation permits the development of adult flies which may fly across the Rio Grande and infest the fruit grown in the regulated area in Texas. To reduce this opportunity inspection and cleanup work are carried on in Matamoros and other Mexican towns adjacent to the regulated area. These operations may involve the disposition of infested fruits and the application of a poison spray to dooryard and fruit trees. This work is carried on with the hearty cooperation of the Mexican officials and citizens residing in that area.

Two highways leave the area in Texas regulated on account of the Mexican fruit fly. Large quantities of fruit are moved over these highways by truck and similar vehicles. To assure that the fruit so moving has been cor-



tified as meeting the requirements of the quarantine, road stations are maintained at appropriate locations. During the current fiscal year it will probably be necessary to open another road station to provide for traffic moving over a new highway.

(c) CITRUS-CANKER ERADICATION

Appropriation Act, 1939.....\$13,485  
Budget Estimate, 1940..... 13,485

PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
Citrus-canker eradication.....	\$13,435	\$13,485	\$13,485
Unobligated balance.....	50	- - -	- - -
Total appropriation.....	13,485	13,485	13,485

WORK UNDER THIS APPROPRIATION

This appropriation provides for the eradication of the bacterial disease of citrus known as citrus canker. These activities are carried on in active cooperation with the responsible agencies of the States concerned and the growers in localities where the disease occurs. Through intensive inspection of nurseries and citrus groves an effort is made to locate and destroy all trees infected with this dreaded disease. As a result of the vigorous campaign which has been carried on against citrus canker in the past, the disease has been practically eliminated from the important commercial citrus areas. However, some isolated infections occur sporadically. The States that were infected are maintaining a close inspection of all citrus properties, and this should be continued. The infections have not been eliminated in Louisiana and Texas, although no infection is known to occur in commercial properties in these States. Infections have been found in noncommercial trees in individual properties in Texas and Louisiana.

The work of eradicating this disease has been intensified by allotments from Emergency Relief funds, and an effort is being made to eliminate the source of all infections. Intensive inspections have been made in Mississippi, Alabama, and west Florida which were previously infected but no infection has been discovered. The locating and destruction of diseased trees in jungle areas where citrus trees occur as voluntary or escape stands of no importance and the elimination of seedlings from areas where infected trees have been removed are important features of the present work. Plants of this type may harbor the disease and prevent the completion of the eradication effort. Because



of the extreme infectiousness of this disease, scattered infections may also occur in dooryard plantings outside commercial districts. It is necessary to follow up the work done in infected commercial properties and reinspect areas in noncommercial sections, even where trees have been removed, to see that all the shoots or sprouts have been eliminated or are free from infection. The presence of outside centers of infection are a menace to citrus cultures, and continued inspection and eradication work are essential until the disease has been completely eliminated.

#### EMERGENCY FUNDS

Projects	Obligated, 1938	Estimated obligations, 1939
Emergency Relief Appropriation Act of 1937:		
Citrus-canker eradication.....	\$44,569	- - -
Emergency Relief Appropriation Act of 1938:		
Citrus-canker eradication.....	- - -	\$41,063
Total, Emergency Funds.....	44,569	41,063

#### (f) SWEETPOTATO WEEVIL CONTROL

Appropriation Act, 1939.....\$75,000  
 Budget Estimate, 1940.....75,000

#### PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
Sweetpotato weevil control.....	\$64,627	\$75,000	\$75,000
Unobligated balance.....	10,373	- - -	- - -
Total appropriation.....	75,000	75,000	75,000

#### WORK UNDER THIS APPROPRIATION

This appropriation provides cooperation with States in the control and eradication of the sweetpotato weevil. The sweetpotato weevil is an introduced insect which is a limiting factor in the production of sweetpotatoes in the area where the pest occurs. The grub feeds within the





vines and tuber of the sweetpotato. It so injures the tuber that it is of little or no value for commercial purposes. The presence of grubs within the vine may cause the destruction of the plant or retardation of its growth. Besides feeding on sweetpotatoes the weevil also feeds on a variety of plants related to the sweetpotato, such as wild morning glories. In localities where such wild hosts persist in a growing stage throughout the year, eradication of the weevil is not practicable; however, production of sweetpotatoes is of no commercial importance in these sections. The work is conducted in cooperation with States and includes intensive inspections to locate infestations in the commercial sweetpotato-producing areas; enforcement of quarantine measures to prevent the spread of the pest to uninfested areas and reinfestation of localities from which the pest has been eradicated; application of eradication measures such as the destruction of host plants, clean-up operations in fields, storages, and the use of sweetpotato seed free from weevil infestation; and the development of methods for fumigating or treating sweetpotatoes to eliminate reinfestation by this means. An important feature consists of educational and demonstrational activities to advise growers on methods of combating the pest, particularly as to the methods which will enable them to carry out work they should do on their own properties.

These activities may be divided into the four groups briefly discussed in the following paragraphs:

Inspections to determine extent of infestation are carried on during the summer months in sweetpotato seed beds and where the volunteer plants were growing in fields in which potatoes were planted the previous year. In the fall, the inspections are concentrated in areas where potatoes are held in storage plants. Inspections in the spring are made largely in areas where sweetpotatoes are produced for bedding purposes.

In localities where infestations have been located in the commercial sweetpotato-producing area, effort is made to eradicate these infestations by the adoption of sanitary practices, including the clean-up of crop remnants, destruction of seed beds after the plants have been removed, and clean-up in and around storage beds, houses, and similar places where sweetpotatoes are stored. These activities are carried on under State authority, and inspectors, State and Federal, supervise and direct the operations. Labor required in carrying out the work is provided by local agencies, including growers, in the area where the work is done.

At the Sunset, La., laboratory studies are being conducted on fumigants or other treatments that can be used to eliminate infestation in tubers stored for home consumption or commercial use in areas where infestation occurs. Tests are made with various fumigants to determine the dosage, time, and temperature requirements to kill the weevils in different stages of maturity without injuring the sweetpotatoes for the purpose for which they are intended. Some of these have shown promising results, but further work is needed to determine those which will be most effective against the weevil and least harmful to the potato.



Cooperating States have promulgated necessary quarantines and regulatory orders to prevent the spread of the weevil into noninfested areas and to prevent the reinfestation of localities in which the weevil is being controlled or has been eradicated. The individuals employed under this appropriation are designated by authorized State agencies to act as State inspectors in the enforcement of regulatory measures and cooperate with State inspectors in such work.

(g) PHONY PEACH AND PEACH MOSAIC ERADICATION

Appropriation Act, 1939.....\$89,800  
 Budget Estimate, 1940.....89,800

PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
Eradication of phony peach and peach mosaic.....	\$89,550	\$89,800	\$89,800
Unobligated balance.....	250	- - -	- - -
Total appropriation.....	89,800	89,800	89,800

WORK UNDER THIS APPROPRIATION

This appropriation provides for the control and eradication of two important virus diseases of peach. One of these diseases is known as phony peach and is a serious infectious disease which makes peach orchards unprofitable by reducing both the size and quality of the crop. The other, peach mosaic, is a disease which has only recently appeared in parts of the United States. It injures the tree by causing it to become stunted and produce undersized fruit which is hard, irregular in shape, and of reduced commercial value. The only method of combating these diseases is to remove and destroy the tree. These operations are carried on in cooperation with State agencies. The appropriation also provides for cooperation with State authorities in the certification of products of the infested areas to meet the requirements of State quarantines.

The accurate determination of trees infected with phony peach disease or with the peach mosaic disease requires special training. One of the important phases of eradication work carried on under this item in cooperation with the States includes inspections to locate diseased trees. These operations are conducted by trained inspectors employed under this project. The removal of diseased trees is carried on under the authority of the cooperating States and with funds or means supplied by them or from emergency funds allotted to the Bureau for this purpose. To prevent long-distance spread through the shipment of nursery stock containing diseased trees, intensive



inspections are made in and around nurseries that produce peach nursery stock. The shipment of nursery stock from areas in which the disease occurs is prohibited by State quarantines unless it is produced on premise 'n which no disease occurs within a radius of one mile in the case of phony peach and five miles in the case of peach mosaic. Inspectors employed under this item cooperate with the State agents by giving them assistance which will aid them in certifying products in compliance with State quarantines. During the past year the Bureau has been instrumental in bringing about standardized phony peach disease quarantines in all the affected States.

The phony peach disease has been found in the States of Alabama, Florida, Georgia, Arkansas, Illinois, Oklahoma, Louisiana, Mississippi, Missouri, North Carolina, South Carolina, Tennessee, and Texas. A few trees which have been affected with the disease have also been located in Maryland, Indiana, Kentucky, and Pennsylvania. The infection in most of the States is scattering with the exception of that which occurs in the main peach producing areas of Georgia, Alabama, Tennessee, and South Carolina. The disease was first located in Georgia. The peach mosaic disease has been found in Arkansas, Colorado, Utah, California, New Mexico, Arizona, Texas, and Oklahoma.

Emergency funds for relief purposes have been allotted to the Bureau to carry on work against both of these diseases. The continuation of such allotments is necessary to any large-scale program of eradication, as the regular funds are required for technical and supervisory features. The work conducted with emergency funds has made it possible to make very substantial progress in the elimination of diseased trees. On certain areas, particularly sections where the phony peach occurs, large numbers of abandoned trees and seedlings which may harbor the disease have also been destroyed.

#### EMERGENCY FUNDS

Projects	Obligated, 1938	Estimated obligations, 1939
<u>Emergency Relief Appropriation Act, 1937:</u>		
Control of phony peach disease.....	\$100,865	- - -
Control of peach mosaic disease.....	199,306	- - -
Total.....	300,171	
<u>Emergency Relief Appropriation Act, 1938:</u>		
Control of phony peach disease.....	- - -	\$80,000
Control of peach mosaic disease.....	- - -	69,872
Total.....		149,872
Total, Emergency Funds.....	300,171	149,872





(h) FOREST INSECTS

Appropriation Act, 1939.....\$253,100  
 Budget Estimate, 1940..... 253,100

PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
Investigations on forest insects:			
(a)- Bark beetles attacking forest and shade trees.....	\$48,012	\$48,400	\$48,400
(b) Insects which feed on foliage of forest and shade trees.....	14,880	17,000	17,000
(c) Insects which bore through the wood and bark of forest and shade trees.....	4,960	5,000	5,000
(d) Sucking insects which attack forest and shade trees.....	1,500	4,000	4,000
(e) Insects attacking forest trees in nurseries, plantations, and areas of natural reproduction....	5,952	3,000	3,000
(f) The relation of climatic factors, such as heat, cold, moisture, etc., on forest insect populations.....	3,000	3,000	3,000
(g) Insecticides for the control of insects attacking forest and shade trees.....	15,177	12,000	12,000
(h) Injection of chemicals into the sapstream of the tree for the control of bark beetle infestations and for the treatment of green trees to prevent insect attack upon the utilized wood....	5,654	5,200	5,200
(i) Insects affecting forest products.....	4,000	4,000	4,000
(j) Habits and development of methods for control of termites.....	9,920	11,000	11,000
(k) Value and use of introduced and native parasitic and predacious enemies upon introduced and native forest insects.....	8,729	10,000	10,000
(l) Importation of natural enemies of forest and shade tree insects.	2,400	2,500	2,500
(m) Surveys to locate and determine the status of insect pests of the forests and the giving of advice to land-managing agencies on planning and conducting necessary control work .....	73,616	74,210	74,210



## PROJECT STATEMENT - Continued

Projects	1938	1939 (Estimated)	1940 (Estimated)
Investigations on forest insects - Continued:			
(n) Relation of insects to the Dutch elm disease.....	\$24,204	\$24,400	\$24,400
(o) Relation of insects to azalea flower blight.....	398	400	400
(p) Dissemination of information to the public on methods of con- trolling forest and shade tree insects, including general in- quiries on this subject.....	28,791	28,990	28,990
Unobligated balance.....	1,907	- -	- -
Total appropriation.....	253,100	253,100	253,100

## WORK UNDER THIS APPROPRIATION

General.--This appropriation provides for investigations on insects injurious to forest and shade trees and forest products and for the determination of methods for controlling these pests. It provides for giving advice to land-managing agencies on methods of controlling insect pests in forests and for surveys to develop facts regarding infestations and the areas where the control operations should be carried on. It also provides for cooperation with the land-managing agencies in planning and directing campaigns to control outbreaks of insects which may affect large forested areas.

The activities are directed by the Division of Forest Insect Investigations from headquarters in Washington. The investigations and surveys are conducted from laboratories located in appropriate localities in the field and usually in the same towns as the experiment stations maintained by the Forest Service. The present field laboratories are located at New Haven, Conn., Morristown, N.J., Asheville, N.C., New Orleans, La., Milwaukee, Wis., Fort Collins, Colo., Berkeley, Calif., Portland, Oregon, and Coeur d'Alene, Idaho. The activities are divided into a number of work projects which are briefly discussed in the following paragraphs:

(a) There are nearly 400 different kinds of bark beetles which attack forest and shade trees. Many of these are important pests, particularly those belonging to the genus Dendroctonus, which cause extensive destruction in coniferous forests. Bark beetles occur in all parts of the United States. Those which are major pests of coniferous trees occur in all sections. The distribution of the various species is, however, restricted by various factors. Certain of the important species feed on a number of different kinds of pines and in some localities a number of kinds attack the same kind of trees. The various species differ in habits and the method of control and the season when the work can be done depends on the kind of bark beetle



but also on locality and the species of tree attacked. Control measures now recommended for important tree-killing bark beetles consist very largely of felling the trees and removal or destruction of the bark. These operations are costly and cannot be carried out economically except in connection with logging operations. Further studies on the habits and development of the beetles and experiments to test other methods of control should lead to the development of control measures which can be applied more economically. Some promising suggestions have been obtained. These include the use of penetrating oils in which toxic chemicals are dissolved and which can be sprayed on the tree so as to kill the insects within or beneath the bark. Investigations on the bark beetles are conducted at practically all the laboratories but receive special attention at those located in California, Colorado, Oregon, and Idaho.

(b) There are many different kinds of insects which feed on the foliage of forest and shade trees. By far the greater number of these are native to the United States. Some of the important pests, such as gypsy moth, brown-tail moth, willow beetle, etc., have been introduced from foreign countries. The methods of combating these insects on forest and shade trees depends upon the kind of insect and on the kind of tree attacked. The cost of the application of control measures, particularly those applied for the protection of forest trees, is an important, and often limiting, factor in protecting trees from leaf-feeding insects. The investigations to develop more economic and effective methods of combating various species which feed on the foliage are carried on at many of the laboratories. Particular attention is being directed to the development of methods of control of the canker worm, various tent caterpillars, the bud worms and leaf miners. Work under this project will be intensified during the current fiscal year in an effort to cope with the inroads of the European spruce sawfly, the forest tent caterpillar, and other defoliators.

(c) Many kinds of native insects, especially the larvae of beetles, bore into the wood and bark of forest and shade trees. The habits of the various kinds differ greatly. Some attack the trees only in a weakened condition. Others attack healthy trees. There is close association between insects of this type and those which destroy the foliage or suck the sap. In developing methods for the control of insects attacking forest and shade trees, it is necessary to have information regarding the habits of boring insects which may be associated with primary species in order to give appropriate advice regarding control. Studies to secure needed information on these problems are carried on at most of the field laboratories.

(d) Forest and shade trees are attacked by many different kinds of insects which feed on the juices of the plant. These forms include many species of aphids, scale insects, and various other sucking bugs. Certain of these like the beech scale and minute scales, which occur at the base of the leaves of pines, are intimately associated with plant diseases which attack the trees. Little information is available as to the exact relation between these sucking insects and the disease, and limited studies are under way to obtain more information regarding the insect, its relation to the





disease, and to develop methods for control. Scale insects and aphids are common pests of shade and ornamental trees, often causing material damage in cases where the infestation causes the trees to die. Experiments to determine controls for some of these species are conducted at certain laboratories, particularly the one at New Haven, Conn.

(e) Forest and shade trees in nurseries and in plantations and areas of natural reproduction are attacked by many kinds of insects, native and introduced. The introduced species include the European pine shoot moth and the European pine saw fly, which are important pests to nurseries and plantations in New England and adjacent areas. With the development in conservation, which includes much reforestation, the control of insects in nurseries and plantations has become a problem of much importance. Such native insects as the white pine weevil, various kinds of white grubs, and certain bud worms are limiting factors in the production of satisfactory nursery stock and the production of suitable trees in plantations and areas of natural reproduction. Limited investigations are being carried on to develop more information regarding the methods of combating certain of these pests and to develop economical methods for their control.

(f) Abnormal weather conditions, such as unusual low temperatures and drought, affect the abundance of many different kinds of insects attacking forest trees. Limited studies are being carried on at several western stations to determine the relation of climatic factors to outbreaks of various insects, particularly those caused by tree-killing bark beetles. Basic information of this type should have an important bearing on control operations. It has been determined that some of the destructive bark beetles are killed at certain low temperatures. Much work remains to be done, however, in the study of climatic factors, including the correlation of air and bark temperatures.

(g) The most effective way of combating certain kinds of insects that attack forest, shade, and ornamental trees is the application of insecticides. The use of insecticides is particularly applicable in combating insects attacking trees used for shade and ornamental purposes as such materials cannot usually be applied over large forested areas. Studies are now under way to determine the dosage and material most effective in controlling various kinds of insects attacking trees used for shade and ornamental purposes, and limited studies are under way to develop new types of insecticides which can be economically applied to large forested areas by the use either of ground machines or various kinds of aircraft.

(h) Small quantities of certain chemicals are known to be toxic to the immature stages of various kinds of insects which feed on the bark and wood of trees. These materials can be injected into the sapstream of the tree and thus carried throughout the tree. Experiments to determine the type of material which can be most effectively and



economically used to kill bark beetles by injecting chemicals into the sapstream of the tree are being carried on at the laboratory at Asheville, N. C. Further studies on this problem should make it possible to apply this method to other species and in other localities.

(i) The crude forest products are attacked by a wide variety of insects, particularly various kinds of borers. Finished forest products are also subject to attack by boring insects, particularly forms commonly referred to as powder post beetles. Studies are under way to determine methods of preventing various insects from attacking forest products and to develop methods for their control.

(j) Termites cause annual losses of many millions of dollars and are attracting unusual attention because of the increased expansion of building operations adjacent to the larger communities. Many materials are being used by various agencies for killing termites and various new methods are being advocated by certain commercial agencies. To determine the value of these and develop possible new methods for control, additional emphasis has been placed on investigations on termites. This work is being carried on in New Orleans, La., Asheville, N. C., Beltsville, Md., and in the Canal Zone.

(k) Parasites and other natural enemies of forest insects contribute materially to the control of injurious species. Many different kinds of parasitic and predacious insects have been introduced to aid in combating insects attacking forest trees, particularly the gypsy moth, brown-tail moth, satin moth, and the European pine shoot moth. Studies to determine the value of these natural enemies in combating these introduced insects are being carried on at the laboratory at New Haven, Conn. This laboratory is also engaged in recolonizing various introduced and native parasites and predators which offer promise as aids in controlling injurious species.

(l) Explorations to locate parasites of introduced insects that attack forest and shade trees are being carried on in Europe, and the species which may aid in control are imported. Special attention is now being directed to importation of parasites of the larch case-bearer, the fir bark louse, and the European spruce saw fly.

(m) Land-managing agencies, such as the Forest Service, National Park Service, and Bureau of Indian Affairs, as well as private timber owners, look to the Bureau of Entomology and Plant Quarantine for advice on methods of controlling insect pests in forests and for planning the necessary control work. To give such advice it is necessary to conduct survey to determine the status of insect pests in the forests, locate areas of infestation, and secure other information needed in planning control campaigns. The forests of the United States are extensive. To make it possible to secure



information as to the status of insects from as much of the area as all available facilities will permit, forest rangers and others engaged in similar tasks are informed on various important pests and aid in assembling information regarding the status of these pests in forest areas where they are located. Reports received from these sources are preliminary in character, and before recommendations for control can be made it is necessary to make intensive surveys which can be used as a basis of plans for control operations. The surveys as carried on in the various regions are directed from the field laboratories where close contact and cooperation is maintained with the Forest Service, National Park Service, Bureau of Indian Affairs, and various private timber owners.

(n) The Dutch elm disease is transmitted from tree to tree by certain bark beetles. Studies are under way to gain more information regarding those insects known to transmit the disease and to determine whether others may also serve as carriers. In carrying out the eradication work it is necessary to have definite information regarding the habits of the various insect vectors in order that these may be controlled and thus aid in reducing the spread of the disease. An important feature of the work is to obtain information regarding the flight range of the various insect carriers of the disease in order to determine their distribution and the effectiveness of various methods of reducing their numbers.

(o) Azaleas in limited parts of the Southeastern States, particularly in the vicinity of Charleston, S. C., are destroyed by a blight which affects the bloom. This blight is caused by a disease and apparently it may be transmitted from plant to plant or flower to flower by various insects. Limited investigations are under way to determine the relation of insects to the transmission of this disease. These are carried on in cooperation with the Bureau of Plant Industry.

(p) Many inquiries are directed to the Washington and field offices regarding methods of controlling insects attacking forest and shade trees. The preparation of replies to these various inquiries is a part of the duties of all of the field laboratories and an important part of the work of the Washington office requiring the time of employees stationed here.





## (i) GYPSY AND BROWN-TAIL MOTH CONTROL

Appropriation Act, 1939.....\$375,000  
 Budget Estimate, 1940..... 375,000

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
1. Inspection and certification for gypsy and brown-tail moth control..	\$98,166	\$99,282	\$99,282
2. Control operations for gypsy and brown-tail moth control.....	300,180	275,718	275,718
Unobligated balance.....	1,654	- - -	- - -
Total appropriation.....	400,000	375,000	375,000

## WORK UNDER THIS APPROPRIATION

General.--This item provides for control work on the gypsy and brown-tail moths and for the inspection and certification of products to meet the requirements of the Federal quarantines for these insects. The work is divided into two projects as follows:

1. Inspection and Certification for Gypsy and Brown-tail Moth Control.--The work under this project deals with the inspection and certification of products originating in the quarantined area designated for shipment to points outside. The possibility of the distribution of the gypsy moth over long distances on shipments of products which might carry it is illustrated by records on such shipments. Infestations have actually been discovered on and removed from shipments destined to practically every State in the Union. This inspection and certification covers commodities which are grouped into nursery, quarry, forest, and evergreen products. The certification is based on inspection, and the commodities thus inspected and certified are eligible for interstate transportation. Industries located within the infested area which deal with articles likely to carry these insects are enabled under Federal certification to ship their products in the normal way. If there were no Federal quarantine, State quarantines (which are practically embargoes) would be in effect in nearly every State; and interstate business in such articles would operate under a severe handicap in the face of such a system of State embargoes.

2. Control Operations for Gypsy and Brown-tail Moths.--The work under this project is concerned with the control and extermination of infestations of gypsy and brown-tail moths which are so located as to be susceptible to spread by natural means to points outside the infested area. This work is carried on in cooperation with State agencies which make material contributions.



The activities are carried on in the area immediately outside the known infested section, referred to as the Barrier Zone, and at points beyond where infestation has been found.

The Barrier Zone is an area some 20 to 30 miles in width, extending from Long Island Sound on the south to the Dominion of Canada on the north. This strip of land extends over into New York State for its western boundary and into the New England States for its eastern boundary, the center of the zone being approximately the eastern New York State boundary line. Spread of moths by natural means from the generally infested area in New England into and through the Barrier Zone is controlled by the application of extermination measures in this zone. This requires scouting to locate infestations and their treatment to eliminate colonies which may be found.

Gypsy and brown-tail moths have been kept confined to the comparatively limited area comprising the New England States. The gypsy moth has been found on Long Island and in the Bronx, N. Y., in northeastern Pennsylvania, and in New Jersey. These are the only known infestations for either of these insects outside of New England. The infestation in New Jersey was small and is believed to have been completely eradicated, although the area which was infested is still the subject of frequent and thorough inspections. The nature of the work in these outlying infestations is similar to that employed in the Barrier Zone, consisting of scouting to locate infestations followed by the application of suppressive measures with the object of complete extermination. The infestation in Pennsylvania was found in 1932. Cooperation of the States concerned is an important factor in the progress which has been made in dealing with these infestations.

Large allotments have been made available from emergency funds for the control of the gypsy and brown-tail moths. The supervision of this work is provided for by the organization employed under the regular appropriation.

#### EMERGENCY FUNDS

Projects	Obligated, 1938	Estimated obligations, 1939
<u>Emergency Relief Appropriation Act, 1937:</u>		
Control and prevention of spread of gypsy moth	\$1,290,280	- - -
<u>Emergency Relief Appropriation Act, 1938:</u>		
Control and prevention of spread of gypsy moth	- - -	\$592,720
Total, Emergency Funds.....	1,290,280	592,720



## (j) BLISTER RUST CONTROL

Appropriation Act, 1939.....\$300,000  
 Budget Estimate, 1940..... 300,000

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
1. White-pine blister rust control operations:			
(a) Eastern control program....	\$132,325	\$140,800	\$140,800
(b) Western control program....	145,772	149,200	149,200
2. Enforcement of quarantine on white-pine blister rust.....	14,560	10,000	10,000
Unobligated balance.....	7,343	- - -	- - -
Total appropriation.....	300,000	300,000	300,000

## WORK UNDER THIS APPROPRIATION

General.--This appropriation provides leadership and technical direction for campaigns conducted for the suppression and control of white-pine blister rust by emergency funds allotted to the Bureau of Entomology and Plant Quarantine, by funds available to the Forest Service, National Park Service, and Indian Service and the work done by cooperating State organizations, counties, towns, and individual land owners. These activities consist of eradication of Ribes (currants and gooseberries), which serve as carriers of the disease, and the application of measures to delay the spread of the disease into uninfected regions, including the enforcement of the Federal quarantine on white-pine blister rust.

This work is conducted under two main projects--one concerned with a control program and the other with the enforcement of the Federal quarantine on white-pine blister rust.

1. White-pine Blister Rust Control Operations.--The work under this project provides national leadership for the control of the white-pine blister rust and is carried on in cooperation with the appropriate agencies. For convenience the work has been divided into two parts--Eastern Control Program and Western Control Program.

(a) Eastern Control Program.--The Department is cooperating in the control of blister rust through formal and informal arrangements with governmental agencies, States, counties, townships, individuals, and other local agencies in the control of white-pine blister rust in white-pine growing regions in Connecticut, Maine, Massachusetts, Michigan, Minnesota, New





Hampshire, North Carolina, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Wisconsin, Maryland, Delaware, Virginia, West Virginia, Ohio, Illinois, Indiana, Iowa, Tennessee, Kentucky, Georgia, and South Carolina. In this work the Department provides the leadership and coordination of the control activities and the States and their cooperators supply the supervision and labor. The work includes surveys to locate pines and areas where *Ribes* are growing; supervision of the work for control done by cooperating States, counties, and towns, or with emergency funds available to the Bureau or other agencies for white-pine blister rust control; and checking the eradication work to determine its thoroughness.

The eastern control program is necessary (1) to assure the productivity of white-pine forests containing standing timber valued at over \$126,000,000; (2) to preserve regional scenic and recreational white-pine values of great economic importance; (3) to protect thousands of acres of young growth which will form the next timber crop; (4) to maintain control of the disease on initially protected pine lands, aggregating 8,500,000 acres; (5) to apply control measures on the remaining unprotected pine acreage in the infected States; and (6) to extend protection to white pines in disease-free regions as rapidly as they are invaded by the natural spread of the disease. This is a national problem, requiring Federal leadership and technical knowledge to coordinate cooperating agencies.

(b) Western Control Program.---In the western area the control of white-pine blister rust is carried on in California, Idaho, Montana, Oregon, Washington, Wyoming, and Colorado. In this area the Department assists cooperating State and local agencies in the application of control measures on State and privately-owned lands and furnishes leadership and technical assistance in coordinating the control activities carried on in these areas by the Forest Service in protecting valuable white pines in the national forests, and to the National Park Service and Indian Service in protecting valuable areas of white pines in national parks and on Indian reservations. The forested lands in this area are of mixed ownership, and control can be accomplished only by combining and coordinating efforts of all owners into a single program. The work will include surveys to locate pines and areas where *Ribes* grow; application of methods of eradicating *Ribes* plants; supervision of control work done in the national forests and national parks and on private lands with funds supplied from other sources; and checking to determine the status of the control work.

Continuation of the blister-rust control program in the western United States is essential (1) to assure the productivity of forest lands bearing western white-pine and sugar-pine timber valued at \$268,000,000 and thus maintain industries dependent upon the white pine, which represent 50 percent of the business of the western white-pine region, as well as valuable economic and business interests in the sugar-pine region of California; (2) to protect millions of acres of young growth that will form the next timber crop; (3) to prevent forced timber cutting and demoralization of the Nation's lumber markets; (4) to maintain control of the disease in areas already protected; (5) to apply control measures on the remaining unprotected areas; (6) to preserve the scenic and recreational white-pine values of great economic importance; and (7) to extend protection to white pines in uninfected regions as rapidly as they are invaded by the natural spread of the rust.



2. Enforcement of Quarantine on White-pine Blister Rust.--The work under this activity is concerned with the enforcement of the Federal quarantine on account of white-pine blister rust. For the most part this work consists of preventing the interstate shipment of rust-infected pines or currant and gooseberry plants likely to carry the disease and not meeting the requirements of the Federal quarantine. Some work is also being done along the line of inspecting the premises and environs of nurseries in which pines susceptible to the disease are grown.

#### EMERGENCY FUNDS

Projects	Obligated, 1938	Estimated obligations, 1939
<u>Emergency Relief Appropriation Act of 1937:</u>		
White-pine blister rust control.....	\$1,679,357	- - -
<u>Emergency Relief Appropriation Act of 1938:</u>		
White-pine blister rust control.....	- - -	\$1,174,634
Total, Emergency Funds.....	1,679,357	1,174,634



## (k) DUTCH ELM DISEASE ERADICATION

Appropriation Act, 1939.....\$378,489  
 Budget Estimate, 1940..... 378,489

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
1. Dutch elm disease eradication:			
(a) Scouting to locate the Dutch elm disease.....	\$318,596	\$273,433	\$273,433
(b) Identification of disease in trees suspected to be infected with the Dutch elm disease.....	36,256	40,500	40,500
(c) Enforcement of quarantine on Dutch elm disease.....	4,740	5,000	5,000
(d) Coordination of State work on the Dutch elm disease.....	49,807	45,056	45,056
(e) Removal of diseased, dead, and dying trees.....	38,450	14,500	14,500
Unobligated balance.....	13,011	- - -	- - -
Total appropriation.....	460,860	378,489	378,489

## WORK UNDER THIS APPROPRIATION

This appropriation provides for supervisory and administrative personnel and expenses for the eradication of the Dutch elm disease from the United States and for the enforcement of the domestic quarantine to prevent the spread of the disease into uninfected regions. This includes scouting to locate the presence of the disease, the identification of suspected samples, the co-ordination of work done by various agencies, especially the cooperating States, and other activities concerned with the eradication of this disease which threatens the destruction of elms in the United States. The work of eradicating the Dutch elm disease is also supported by allotments of funds from emergency relief appropriations.

An important feature of the effort to eradicate the Dutch elm disease is scouting and locating its presence. The origin of the Dutch elm disease in the United States is traced rather definitely to elm burl logs imported for the manufacture of furniture veneer. These logs were known to be infested with the insects which carried the disease and some were also infected with the disease. These logs were entered at a number of different ports and were sent to various localities to be cut into veneer. The beetles that were infected with the disease may have escaped to many points





on route to the factory or in the vicinity of the ports through which they were imported. It is necessary to inspect the right-of-ways of railroads over which these logs were transported to locate the possible presence of trees infected with the Dutch elm disease. The largest center of infection occurs in the vicinity of New York Harbor, comprising an area of approximately 50 miles in diameter in the States of Connecticut, New York, and New Jersey. In this area of heavy infection it is necessary to make intensive and repeated inspections to locate the presence of infected trees.

The external symptoms of the Dutch elm disease consist of the discoloration and wilting of the foliage. There are other diseases of the elm which also produce similar external symptoms. The only way to determine definitely that the tree is infected with the disease is to secure samples and culture them in a laboratory to isolate and determine the causative organism. It is essential that these laboratory examinations be made promptly so there will be no delay in the removal of the trees that are infected with the disease. Because of the infectious nature of the samples, it is essential that they be handled in such a way as to prevent possible contamination and prevent the infection of healthy trees.

The domestic quarantine placed on account of the Dutch elm disease prohibits the movement from the regulated area of logs, lumber, nursery stock, etc., which may carry the disease into uninfected regions.

The States in which infection has been located are cooperating in the eradication of this disease. They contribute funds and means for this purpose and provide the authority for the removal of the infected or weakened trees and also carry out certain phases of the operation. An important part of the work carried on under the project is the coordination of the activities done by the various agencies, including States, to eradicate this disease.

The only way that the Dutch elm disease can be eradicated is by the removal and destruction of infected trees. The effort of eradication also includes the location and removal of dead and dying trees in which the beetles that carry the disease from tree to tree may breed. The work concerned with the removal of trees is carried on very largely by funds supplied by State or local agencies or by the use of emergency funds provided to combat the disease. Certain features of the work involved in the removal of diseased or dead and dying trees are a part of the work conducted under this project.



## EMERGENCY FUNDS

Projects	Obligated, 1938	Estimated obligations, 1939
<u>Emergency Relief Appropriation Act, 1937:</u>		
Eradication of Dutch elm disease.....	\$2,803,220	- - -
<u>Emergency Relief Appropriation Act, 1938:</u>		
Eradication of Dutch elm disease.....	- - -	\$1,932,000
Total, Emergency Funds.....	2,803,220	1,932,000

## (1) TRUCK CROP AND GARDEN INSECTS

Appropriation Act, 1939.....\$461,580  
 Budget Estimate, 1940.....381,580  
 Decrease.....80,000

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)	Decrease
1. Truck crop insect investi- gations.....	\$189,021	\$189,143	\$189,143	- - -
2. Berry insect investigations..	11,104	11,147	11,147	- - -
3. Sugar-beet leafhopper in- vestigations.....	74,074	74,390	74,390	- - -
4. Tobacco insect investigations	63,877	63,900	63,900	- - -
5. Insects affecting greenhouses and ornamental plants.....	42,986	43,000	43,000	- - -
6. Constructing and equipping a laboratory for investigations of tobacco insects and dis- cases in North Carolina.....	- - -	80,000	- - -	-\$80,000(1)
Unobligated balance.....	518	- - -	- - -	- - -
Total appropriation.....	381,580	461,580	381,580	- 80,000



## DECREASE

(1) The decrease of \$80,000 in this appropriation for 1940 is due to the elimination of a nonrecurring item provided in 1939 for constructing and equipping a laboratory in North Carolina, as the work will be completed during the fiscal year 1939.

## CHANGE IN LANGUAGE

It is proposed to amend this paragraph by striking out the clause "of which \$80,000 shall be immediately available for construction and equipment of laboratory and service buildings and necessary facilities." Since this work will be completed during the current fiscal year, the authority will no longer be required.

## WORK UNDER THIS APPROPRIATION

General.--This subappropriation provides for research to develop means of controlling insects injurious to truck crops and garden plants, including vegetables, flowers, bulbous plants, potted ornamentals, and plants grown under glass, as well as such related crops as strawberries, raspberries, blackberries, sugar beets, and tobacco. It also provides for investigations on the European carwig, pests of mushrooms, and soil insects such as wireworms and white grubs attacking vegetables. These activities are under the direction of the Division of Truck Crop and Garden Insect Investigations, with headquarters in Washington. Field laboratories are maintained in certain of the more important trucking regions and in localities where bulbs and other ornamental plants are produced.

1. Truck Crop Insect Investigations.--The activities conducted under this project are concerned with insects affecting truck crops such as beans, peas, melons, potatoes, sweetpotatoes, onions, and cabbages. Investigations are now being conducted on a wide variety of insects injurious to truck crops, including cabbage worms, semi-tropical army worm, pepper weevil, thrips and red spider, mole crickets, the European carwig, pea aphid, sweetpotato weevil, Mexican bean beetle, various wireworms, and turnip aphid. Certain phases of these investigations are carried on in cooperation with the Bureau of Plant Industry and the Bureau of Agricultural Engineering. The studies are carried on at some 20 field laboratories located in various parts of the country. For the most part the investigations conducted at a laboratory cover a variety of problems and the laboratory may be considered as regional headquarters for work on truck-crop pests. For example, the pests of cole crops are studied at five different stations.

The determination of satisfactory methods for the control of insects affecting vegetable and garden crops necessitates investigations on many kinds of insects and crops. These studies are important to many large industries, including canning and marketing agencies, to the farmer producing trade crops, and to home gardeners. The development and expansion of the vegetable industry, the increased consumption of green food products, and the demand that these be free from insect damage and insecticidal residues are factors which have contributed to the increasing importance of this work. With the con-





centration of crops in certain areas old pests have increased in abundance and distribution. Many remedies which have been developed for the control of certain pests of truck crops required the use of insecticides containing arsenic. Where heavy infestations occur the pests cannot be satisfactorily controlled without leaving excessive residues. This coupled with the careless use of insecticides by growers emphasizes the need for developing methods of control which will not leave harmful residues. There is an increasing demand for information on the control of insect pests of vegetables, particularly for remedies which will not leave objectionable residues.

2. Berry Insect Investigations.--The work under this project is concerned with the study of insects injurious to the small fruits known as berries, including strawberries, raspberries, blackberries, and loganberries. Work is carried on at two field laboratories -- one at Puyallup, Washington, for problems in the Pacific Northwest, and one at Chadbourn, N. C., for problems in the strawberry sections of the eastern Coastal Plain. In the Pacific Northwest special attention is being given to the development of measures to control the raspberry fruitworm and the blackberry mite. The work on these two pests is directed to the application of insecticides which do not leave objectionable residues and to the method of applying them so they will be effective. Quite recently the strawberry worm has caused serious damage to strawberries in Oregon. The occurrence of large numbers of minute insects called thrips in cans of raspberries and related fruits produced in the Pacific Northwest emphasizes the need for studies to determine methods of controlling this pest, which is a menace to both growers and canners.

At the Chadbourn laboratory in the eastern Coastal Plain special attention is being devoted to the control of the strawberry weevil and the strawberry root aphid. Work on the root aphid, which causes material losses, is carried on in cooperation with the Bureau of Plant Industry. When the strawberry weevil occurs in such numbers that it cannot be controlled by cultural practices, it is necessary to apply insecticides. The present investigation is concerned largely with the development of a remedy which will not, even under most unusual conditions, leave objectionable residues.

3. Sugar-beet Leafhopper Investigations.--The sugar-beet leafhopper is the most important pest of sugar beets in the western part of the United States and also damages vegetables. The periodic attacks of this insect result in almost complete failure of non-resistant types of beets. Tomatoes, beans, and squashes in certain areas are also subject to severe damage. The leafhopper transmits the destructive disease known as curly top. One insect may transmit the disease to a number of plants. The leafhoppers invade fields in large numbers in the migration periods, and direct control in the fields has not been found practicable. The work on this insect in the different sections varies in scope and is divided into two work projects.

In the Intermountain Region the investigations are carried on from laboratories at Twin Falls, Idaho, Phoenix, Ariz., and Logan, Utah. They consist principally of surveys made to determine the abundance of the beet leafhoppers and the availability of their favorite host plants in their



natural breeding areas, studies to determine the value of sprays and trap crops, field studies and surveys to outline the main breeding areas, and modification of these due to natural or artificial causes.

In California the studies are concerned with the determination of the value of spraying wild host plants, with the elimination of breeding areas as a means of control, and the relation that populations of the leafhopper have to damage to tomatoes and other truck crops and the production of beet seed.

4. Tobacco Insect Investigations.--This work is concerned with the study of insects injurious to tobacco both in the field and in storage. It involves studies of the life history, habits, and methods of control of such insects by the use of insecticides, attractants, baits, fumigants, and cultural practices.

The work on insects attacking tobacco in the field is now carried on in four of the main areas which produce various types of tobacco. The work in the dark fire-cured area is located at Clarksville, Tenn.; that in the flue-cured area at Oxford, N. C., supplemented by studies at Florence, S. C.; and that on insects attacking shade-grown tobacco at Quincy, Fla., and Windsor, Conn., in cooperation with the State experiment stations. Satisfactory controls that will not leave objectionable residues are not available for the control of many of the important pests, such as the hornworm and flea beetle. There is apparently some danger to tobacco users from insecticidal residues that may occur on the marketed product. Concerns purchasing tobacco for manufacturing purposes are giving attention to the amount of visible residue that may occur. This emphasizes the need of the development of controls which will eliminate objectionable residues. In the dark fire-cured area tests are under way to determine the practicability of the use of poison bait feeders as an aid in the control of the hornworm moth, and work is also being done with several types of traps. Experiments to determine the effect of such insecticides as derris are under way, as well as studies to determine the possibility of using pyrethrum or other organic compounds. The type of treatment most effective for the control of the sod webworm is also receiving some attention. The most important pest of tobacco used for cigar wrappers is the tobacco flea beetle. During the past two seasons particular attention has been directed to the use of derris and cube dusts as a control for this pest and preliminary results indicate that these materials will be satisfactory for the control of this insect, at least when the value of the tobacco will justify their use. Attention is also being directed to the methods of control of the tobacco thrips.

Investigations on insects affecting tobacco in storage which have been under way for a few years were undertaken in response to the demand of the tobacco trade of the United States. They are chiefly concerned with the development of methods of controlling the tobacco moth and the tobacco beetle in both the closed and open type of warehouses. Some very useful and interesting information has been obtained, and such conclusions as to control measures as have been developed have been made available to the trade. Aside from the protection of tobacco produced





within the United States, these investigations have a bearing on the production of a product sufficiently free from insects to meet the requirements of countries to which American tobacco is exported.

The infestation in closed storages can be materially reduced by the use of traps and fumigants. It is not practical to apply these methods in the open storages, and studies are being made to determine other measures of control such as the use of sprays and dusts.

5. Insects Affecting Greenhouse and Ornamental Plants.--The work under this project deals with investigations to determine methods for controlling insects attacking flowering garden plants such as narcissus, tulip, dahlia, etc., and household and ornamental plants; insects injurious to flowers and all kinds of plants grown under glass; and insects injurious to mushrooms. There are many pests of these plants and in many cases the control which may be used successfully on one kind of plant cannot be used on other kinds of plants. In determining controls for a given insect pest it is necessary to test them on most of the kinds of plants attacked and to study the control in relation to the culture of the plant. Some of the pests of greenhouse and ornamental plants now receiving special attention are (1) the cyclamen and broad mites--insects extremely difficult to control and which, according to a conservative estimate, cause annual losses to greenhouse interests approximating one million dollars; (2) insect vectors of important mosaic diseases of rose and narcissus, certain of these diseases apparently being transmitted by insects which may be fairly easily controlled; (3) the iris thrips, a widely distributed pest especially difficult to control where the tubers are left in permanent locations; (4) the greenhouse red spider, a pest which attacks a wide variety of plants and causes losses throughout the country; (5) the gladiolus thrips, a limiting factor to the successful production of this favorite garden flower; (6) aphids and white flies attacking greenhouse plants; (7) bulb mites, including a number of species which seriously injure narcissus bulbs and flowers and for which satisfactory control measures are not yet available; additional facts are also needed before all varieties of bulbs can be disinfected to eliminate mites; and (8) narcissus bulb flies, for which present methods of field control are not fully effective, although satisfactory methods for disinfecting narcissus bulbs have been developed.

The most important pest problems confronting the producers of mushrooms are maggots and mites. The control measures now available to the commercial producer are not fully effective. Conditions that must be maintained in the house for the satisfactory growth of mushrooms make it difficult to fumigate. Mite control is especially difficult because the fumigants ordinarily used do not penetrate the compost and reach the mite without injury to the mushroom. Progress has been made, however, in the use of methyl bromide as a fumigant and the use of nicotine and pyrethrum compounds as drenches. Progress has also been made in the development of light traps.

6. Construction and equipping of a laboratory for investigations on tobacco insects and diseases in North Carolina.-- The building to be constructed will provide for the needs of the Bureau of Plant Industry





as well as this Bureau. A site to be furnished by the State of North Carolina has been selected in the vicinity of Oxford. Title is now being transferred to the Government, and plans and specifications for the laboratory are being completed with a view to early construction. It is anticipated that work will be finished during the current fiscal year.

## (m) CEREAL AND FORAGE INSECTS

Appropriation Act, 1939 .....	\$363,669
Budget Estimate, 1940 .....	383,700
Increase .....	<u>20,031</u>

## PROJECT STATEMENT

Projects	1938	1939 :(Estimated):	1940 :(Estimated):	Increase
1. Cereal and forage insect investigations.....	\$251,812	\$253,214	\$273,245	+\$20,031 (1)
2. European corn borer investigations.....	78,754	78,968	78,968	- - -
3. Sugarcane and rice insect investigations.....	30,989	31,487	31,487	- - -
Unobligated balance.....	2,774	- - -	- - -	- - -
Total appropriation.....	364,329	363,669	383,700	+ 20,031

## INCREASE

(1) An increase of \$20,031 is requested under the project "Cereal and Forage Insect Investigations" for investigations on the white fringed beetle. Shortly over a year ago there came to the attention of the Bureau an introduced weevil, believed to be a native of South America, which had been attacking a wide variety of plants in the southeastern part of the United States. Since that time it has become apparent that this insect, known as the white fringed beetle, is an exceedingly destructive pest which has established itself at least in limited areas in Florida, Alabama, Mississippi, and Louisiana, constituting a serious menace to practically all crops grown in that section of the country. Control and eradication work is being carried on in cooperation with State and local agencies under an allotment of funds from the appropriation for "incipient and emergency outbreaks of insect pests and plant diseases." These control efforts have been severely handicapped by a lack of definite information as to the insect's life history and habits and of the control methods which would prove most effective against it. Information on these subjects is essential for the eradication effort and to prevent the spread of the insect. The funds provided under the general authorization for the control of incipient and emergency outbreak of insect pests are not available for research. To meet



immediate need a limited amount of research work has been carried on particularly at Florala, Ala., under funds already appropriated for research in the field of cereal and forage insects and truck crop and garden insects. The allotments from these funds have been inadequate and have also had the effect of reducing allotments approved for other badly needed research in the general fields concerned. In order to deal effectively with the situation, it is believed that the increase requested should be provided definitely for research work on white-fringed beetle. This would provide for 4 full-time employees, for suitable seasonal help, and for equipment, traveling, and operating expenses of the personnel. The work will in all probability continue to be headquartered at Florala, Ala., and operations would also be carried on at Gulfport, Miss., and New Orleans, La.

#### WORK UNDER THIS APPROPRIATION

General.--This appropriation provides for investigations on insects affecting cereal and forage crops, including sugarcane and rice, and the development of effective and economical methods for their control. Cereal and forage crops are the basis of agriculture over a large part of the United States. The insects attacking these crops annually cause immense losses, and in some areas crops may be completely destroyed by these pests. The investigations conducted under this item are directed by the Division of Cereal and Forage Insect Investigations from headquarters in Washington, D. C. The studies are conducted at field laboratories located in the important crop areas. The investigations are coordinated with those done by other agencies of the Department on these crops and also with that done by State agencies, certain problems being studied cooperatively.

1. Cereal and Forage Insect Investigations.--This project provides for investigations to develop effective and economical means of controlling insects affecting corn, small grains (except rice), and forage crops. There are hundreds of kinds of insects which attack these crops. Some of these are injurious to both cereal and forage crops, while others restrict their activities to single crops. The work now under way is separated into work projects referred to below.

The Hessian fly is the most important single insect pest of wheat. The amount of damage done each year varies with conditions. Surveys are conducted in cooperation with State agencies to determine the status of the pest and give timely information concerning control measures. Investigations are being conducted in cooperation with the Bureau of Plant Industry at certain State experiment stations to determine the varieties of wheat that are resistant to attack. An effort is being made to introduce certain parasitic enemies of Hessian fly that occur in Europe and are not known to be established in the United States and to redistribute the parasites already established in certain areas to sections where they do not now occur and may be of benefit. The work on the Hessian fly is carried on at Carlisle, Pa., Lafayette, Ind., Manhattan and Wichita, Kans., and Sacramento, Calif.



The chinch bug is one of the important pests of corn, small grains and other grass-like plants and occurs generally throughout the eastern half of the country. In favorable years it causes excessive losses. The studies on chinch bugs include those directed to determine varieties of corn and sorghum resistant to attack. These are conducted in cooperation with the Bureau of Plant Industry and certain State experiment stations. Those concerned primarily with the insect deal with the development of more effective measures to prevent the migration of the immature bugs from small grains to corn, development of methods of determining chinch-bug abundance, determination of the effect of winter burning of grasslands, and determination of the value of trap crops near small grains and the effect that agronomic practices have on the abundance of the bugs. Work is headquartered at stations at Lafayette, Ind., and Manhattan, Kans.

The corn earworm is the most destructive generally distributed insect enemy of corn in the United States and occurs throughout the country wherever corn is grown. No satisfactory control is known either for field or sweet corn. Studies so far indicate that indirect methods may be useful in reducing the losses in field corn and that certain direct methods such as the application of insecticides may be effectively used for its control in sweet corn. Previous observations suggest that certain characters of the husk may offer partial immunity from attack. Studies are being made on varieties and strains to determine whether it would be practical to carry on intensive breeding to produce relatively nonsusceptible varieties. Because of the importance of the corn earworm, the work on this pest has been reorganized and coordinated so as to place additional emphasis on the effort to develop effective controls. The activities of the State experiment stations and other units of the Bureau which study it when it attacks other crops are being coordinated into a cooperative program. The field work on this insect as a pest of corn is directed from a laboratory at Urbana, Ill., and special studies are carried on at Arlington Farm, Virginia, Lafayette, Ind., and New Haven, Conn.

The range caterpillar is a native insect occurring in considerable sections of the Southwest, being particularly abundant in New Mexico where it seriously reduces range grasses, resulting in heavy losses to sheep and cattle producers in that area. Studies to determine the effect of native parasites, particularly their colonization in large numbers, indicate this method of control would not be practical in years of heavy outbreak. It may, however, be practical to use such natural controls to prevent the building up of heavy infestations. Studies are now under way to determine the relation of the caterpillars to climatic conditions and abundance of the parasites, and the effect of various climatic and vegetational factors on outbreaks. This work is headquartered at Tempe, Arizona, and much of the actual operation is carried on during the active season from a sub-station at Las Vegas, New Mexico. It is hoped that the present crop season's work will complete these investigations.

There are many different species of insects which attack small grains and grasses. Among those which are now being studied are the black stem sawfly, the European wheat sawfly, joint worms, straw worms, etc. During the past several years the European wheat sawfly has occurred in outbreak





numbers over considerable areas in Ohio and Pennsylvania and caused marked losses to wheat. An effort is being made to colonize an introduced parasite which materially aids in the control of this pest in Europe and is now being established in parts of Canada. The work is conducted from many laboratories. Those at Carlisle, Pennsylvania, and Sacramento, California, have during the past year directed special attention to these various pests.

Sunflowers are an important crop in portions of Illinois, Missouri, and New Mexico, and have been used as a substitute in cases of corn failure, particularly in areas along the river bottoms. Sunflower seed has been made practically worthless for oil production, because of severe insect infestations. The pressing of oil from sunflower seed has practically been discontinued in the Illinois and Missouri areas because of the heavy losses caused by insects. Considerable data are available on the habits and development of the more important insect pests, and the work now under way is concerned primarily with testing methods of control under field conditions. Most of these field studies are conducted in Missouri.

There are many different kinds of insects which carry diseases of cereal and forage crops. At present particular attention is being directed to those insects which are thought to be carriers of the Stewart's disease of corn. It has been definitely determined that at least two species of flea beetles transmit this disease and that certain other species of insects carry the disease over the winter. It is probable that these insects are the main carriers of the disease in the field. This work is conducted at the laboratory at Arlington, Virginia.

The alfalfa weevil is an introduced pest which occurs in a number of western States. It has caused material losses in many sections and because of its importance has been the subject of State quarantines on the movement of alfalfa. During recent drought years these quarantines have been of special importance because of the restrictions on the movement of hay. Studies on the alfalfa weevil are concerned with surveys to determine spread and occurrence, treatments that may be given to hay to eliminate the weevil, and the effect that indirect methods of control--such as proper timing of cuttings--have on weevil abundance and damage. This work is headquartered at Salt Lake City, Utah, and studies are also carried on at Medford, Oreg., and Grand Junction, Colo.

The alfalfa aphid causes severe losses in a number of the Middlewestern and Western States which produce alfalfa. Its abundance is somewhat periodic, particularly in the Pacific Northwest. Direct control by insecticides appears impracticable. In recent years certain strains of alfalfa have been discovered which are highly resistant to aphid attack. The study of these and other strains is now under way in cooperation with the Bureau of Plant Industry and State experiment stations. Certain fungi attack the alfalfa aphid, and work is being done to determine whether it is possible to utilize diseases in field control. The work is carried on at Forrest Grove, Oreg., Manhattan, Kans., and Sacramento, Calif.



There are a number of insects which attack alfalfa and clover seed or interfere with its development. One of the most important is the alfalfa seed chalcid. An effort is being made to determine why recommended methods of control are ineffective in certain localities in the West where this pest is important. These studies require a determination of the relation of grasses and other vegetation to the presence of the pest in fields where seed is produced. This work is headquartered at Tempe, Arizona.

The various forage crops are attacked by many different insects. One of the pests now attracting considerable attention is the hairy vetch bruchid, an introduced insect at present limited to the Central Atlantic States, where it has caused high losses in seed production, in some counties as much as 50 percent of the entire crop. This insect lives in and may be transported in seed, and certain areas where vetch and similar crops are produced for seed are in need of information on control measures and ways of treating seed to prevent the spread of this pest. Other important insects which attack forage crops are the Western spotted cucumber beetle, an important pest of alfalfa and clover seedlings in the Pacific Northwest, and the various leafhoppers which attack alfalfa and often cause heavy losses in the yield and reduce the vitality of plants so that they are injured by winter killing. Studies on miscellaneous insect pests of forage crops are directed from field laboratories at Arlington, Va., Forest Grove, Oreg., and Carlisle, Pa.

The importance of grasshoppers as pests of practically all kinds of cereal and forage crops has long been recognized and has again been demonstrated by the extensive outbreaks of the past two years in some 22 States. There are many different species of grasshoppers that may occur in such abundance as to do excessive damage. When all the various kinds are abundant during the same season losses may be very great. Various species of grasshoppers differ in their habits, particularly as to associations favorable for egg-laying and the reaction to various baits. The kinds which usually are present in cultivated fields are, in the main, quite different from the species which are so destructive to range lands of the plains area. Comparatively little attention is being given to these species except as they migrate into cultivated areas. Special attention is being given to determining more effective and economical baits, especially the development of those which may be substituted for the standard bran mash now recommended. Emphasis is also placed on ecological factors influencing the abundance of the grasshoppers and the habits of the various economic species. These activities are carried on at the following stations: Bozeman, Mont., Forest Grove, Oreg., Tempe, Ariz., and Sacramento, Calif.

One of the most effective ways to prevent the building up of large outbreaks of grasshoppers such as occurred during the past few weeks is to locate centers of incipient infestations and apply control before the infestation builds up to outbreak proportions. To secure information of this nature surveys are carried on in cooperation with various State agencies. In this work the States contribute approximately half of the cost. Its value has been clearly shown in the past two years. The information secured from the cooperative survey is, of course, available to the responsible State agencies and serves as the basis for the organ-



ization of cooperative control work the following season. Without it, it would be impossible to intelligently direct informational work about the outbreaks or distribute bait materials made available from various sources. The continuation of this survey work will develop facts which should serve as an insurance against further outbreaks and avoid the necessity for large appropriations for control. What is equally important, however, is that this survey work will also assemble data on occurrence and distribution in relation to environmental factors, information essential in the development of control measures, and a definite policy on ways of combating these important pests.

During the past two years, the Mormon cricket and its near relative, the Coulee cricket, have occurred in unusual abundance in certain sections in the Intermountain States. In combating these outbreaks the need for more effective and readily applicable methods for control was emphasized, as well as information as to the causes of outbreaks and the possibility of carrying on measures to prevent their occurrence. The work now under way includes studies to improve direct methods of control and observations on status and distribution.

White grubs, the immature stage of June beetles, are important pests of sod lands and cereal crops. Serious damage has occurred over considerable areas in the North Central States region in the past few years, and there have been heavy losses in many isolated sections throughout the United States. The damage is done by the grub and also by the adult beetles. There are many native species of white grubs. The life history of various forms differs--some species complete their life cycle in one year, while others may extend it for two, three, or four years. Methods now available for the control of white grubs are unsatisfactory. In an effort to develop more effective controls, the work on these pests has been reorganized and coordinated. The principal activities are headquartered at Lafayette, Ind., and Madison, Wis.

Cutworms, the larvae of various species of moths, annually cause material losses to cereal and forage crops. At present studies on cutworms are being carried on in the laboratory at Manhattan, Kans., to determine the possibility of avoiding infestations by the method of handling the land during the period when eggs are being laid. Observations are made at various other places throughout the country to determine the flight period of various moths of species known to be of economic importance.

Many of the common pests of cereal and forage crops are attacked by fungous diseases. Comparatively little is known regarding these diseases or the conditions under which they may become abundant. Investigations are conducted in the laboratory at Forest Grove, Oreg., to determine the possibility of using diseases as an aid in control.

It is conservatively estimated that 5 percent of the cereals are destroyed or damaged by various insect pests during the process of milling and while the grain or products are held awaiting milling or shipping. These losses approximate \$300,000,000 annually and are caused by only a comparatively few species which occur throughout the world. Investigations on







insects attacking grain during storage and milling are headquartered at Manhattan, Kans. The studies are carried on in the main milling centers in the vicinity of Kansas City, Mo., and Minneapolis, Minn., and are directed to securing accurate information regarding more effective control methods. One of the standard ways of control is to fumigate, and special attention is given to determining the effect of various dosages of fumigants used, to devising more effective methods of applying fumigants, and to determining the practicability of using vacuum as an aid in eliminating infestation on mill products. These involve the determination of the temperature conditions under which fumigation can be effectively conducted in various types of mills and storages, as well as the effect of wind and other climatic factors on various fumigants and dosages.

Many of the insect pests of cereal and forage crops were introduced into the United States during colonizations. Their natural enemies in many cases were left behind. Effort is being made to import these. At present special attention is being given to the importation of parasites of the Hessian fly and the European wheat sawfly. An effort is also being made to locate parasites of the hairy vetch bruchid and the alfalfa snout beetle, both of which are introduced pests which are attracting considerable attention. The latter is known to occur only in the general vicinity of Oswego, N. Y.

2. European Corn Borer Investigations.-- This project provides for the entomological phases of investigations on the European corn borer. Its objectives are the origination and perfection of effective and economical methods to control the pest and surveys to secure facts as to its status. Special attention is now being given to determine methods of controlling the insect by the use of insecticides. Work on varieties of corn resistant or tolerant to the borer is conducted largely at Toledo, Ohio, and one character of resistance in field corn has been definitely determined. This is being developed in strains, about 140 of which are being studied to select for fixation in varieties suitable for commercial use. Mechanical measures and cultural practices for control are being studied in order to perfect simpler methods and devices which may be used throughout the infested area. The colonization and introduction of parasites is directed largely to the establishment of these natural aids in areas where they do not now occur, especially in western Massachusetts, Connecticut, Long Island, New Jersey, and the newly infested sections of Maryland and Virginia. Surveys to determine general distribution, abundance, and status are continuing and form an important part of the work having a bearing on research and control activities.

3. Sugarcane and Rice Insects.-- This project provides for investigations on insects attacking sugar cane and rice. Headquarters are maintained at Houma and Crowley, La., Beaumont, Tex., and Everglades, Fla. Special attention is now being given to the following activities:

The sugarcane moth borer annually causes very excessive losses to cane in the United States, reducing the yield by boring in harvested cane and injuring the stand by attacking seed cane. Studies are now under way to determine the susceptibility of different varieties of cane to moth in-



festation and to determine characters responsible for resistance and attractiveness. Indications are that certain varieties with a hard rind are less attractive and less susceptible to attack. Information regarding varietal differences may offer a measure of protection from the cane borer. Studies on this insect also include the possibility of utilizing parasites as a means of control.

Certain insects transmit various diseases of cane, particularly the mosaic disease, which is an important limiting factor in the production of cane in Louisiana. The recent discovery of two other species of aphids which carry certain of the mosaic diseases may offer an explanation of the variation in the severity of these diseases on different plantations and locations. The determination of further information about these vectors and their relation to native grass hosts, particularly those attacked by mosaic diseases, and the effect of attending ants on the abundance of aphids need further study. Studies on the insect vectors of these diseases are being carried on in cooperation with the Bureau of Plant Industry.

Among the other insects attacking sugarcane are the sugarcane beetle, which also attacks rice and often causes material losses to both crops, the sugarcane mealybug, wireworms, and the lesser corn-stalk borer. Investigations to determine methods of controlling these pests by artificial and cultural means are under way.

A condition known as "pecky" rice causes excessive annual losses. This condition is the result of feeding of various species of insects on the rice in the field, the results of which are evident on harvested and stored grain. Investigations to determine methods of controlling the insect responsible for this damage are under way. Studies are also being made of the rice stalk borer and of insects which attack the crop in the field and remain with the harvested rice to do further damage in mills and warehouses.

Until about two years ago very little work had been done on the control of various pests of rice in storage. Experiments begun in a limited way to determine the effect of various fumigants and the dosage required to control some of the commoner pests in rice mills and in warehouses where rough and cleaned rice are stored have produced promising results and are being continued.



## (n) EUROPEAN CORN BORER CONTROL

Appropriation Act, 1939.....\$32,939  
 Budget Estimate, 1940..... 32,939

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
Inspection and certification of products regulated by quarantines on the European corn borer.....	\$30,781	\$32,939	\$32,939
Unobligated balance.....	2,158	- - -	- - -
Total appropriation.....	32,939	32,939	32,939

## WORK UNDER THIS APPROPRIATION

This item provides for the certification of products originating in the infested areas to meet the requirements of State quarantines on account of the European corn borer. To secure protection from the artificial spread of the corn borer, following the removal of the Federal quarantine, many States issued quarantines prohibiting or regulating the entry of products that may carry the borer from the infested area. Certain products may be safely moved after adequate inspection. To provide for this inspection and certification the Bureau is cooperating with various States and certifying such products going to States which maintain corn-borer quarantines but do not recognize State certification. There is no reason to anticipate that any developments now in sight will lead to fewer demands for certification.





## (c) BARBERRY ERADICATION

Appropriation Act, 1939.....\$200,000  
 Budget Estimate, 1940.....200,000

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
1. Eradication of the barberry in the 13 States where work was begun in 1918.....	\$173,058	\$174,550	\$174,550
2. Eradication of the barberry in other States.....	21,299	20,800	20,800
3. Inspection of nurseries which ship barberries interstate.....	4,450	4,650	4,650
Unobligated balance.....	1,193	- - -	- - -
Total appropriation.....	200,000	200,000	200,000

## WORK UNDER THIS APPROPRIATION

Funds available under this appropriation provide for cooperation with States, individuals, and other agencies in the eradication of the common barberry, the intermediate host of black-stem rust fungus. The purpose of this work is to control black-stem rust of wheat, oats, barley, and rye and to prevent the occurrence of epidemics of this disease. This work consists of locating and removing bushes of those species or varieties of barberry which serve as intermediate hosts of the fungus. Federal funds are used largely for the supervision and coordination of the work of State and local agencies which supply labor and inspectors and share in the expenses of scouting. Barberries may resprout from portions of roots left in the ground or be produced from seeds which have lain dormant on the ground for some time. It is therefore essential that the areas be reinspected to insure that the plants have been eliminated.

The work of eradicating rust-susceptible barberries was begun in 1918 in the following thirteen States: Colorado, Illinois, Indiana, Iowa, Michigan, Minnesota, Montana, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin, and Wyoming. During the past three seasons similar work has been undertaken in Missouri, Pennsylvania, Virginia, and West Virginia, financed largely from allotments of emergency funds. The work in these areas gives needed protection to local wheat-producing sections which in certain localities is of prime importance from a food standpoint and is largely in the nature of campaigns for local control. That done in certain sections also gives protection to the main wheat crop. This is especially the case in Missouri, where the work is centered in counties adjoining the Illinois and Iowa State lines.



A Federal quarantine prohibiting and regulating the movement of barberry plants is enforced, and a small part of this appropriation is used for the inspection of nurseries which ship barberry plants interstate. Certain varieties of barberry are immune to the disease and under appropriate inspection and certification can move without risk. The movement of rust-susceptible varieties is prohibited.

During the past several years the work of destroying barberry plants has been materially increased by special allotments of emergency funds available for relief. This work has put the program ahead a number of years, with corresponding benefits. All these activities have been and are being directed with the trained regularly-employed Bureau personnel, without which they could not be undertaken. The bulk of the regular appropriation is expended for this supervision, although a small portion of it will be used for the necessary checking of work being done, the coordination of work with local agencies, and the directing of appropriate educational campaigns.

The benefit from the eradication of barberry in wheat areas is well recognized, and farmers, farm organizations, milling and railroad interests, and farm-machinery groups support and endorse the work. State, local, and other agencies also cooperate and support it. There has been a steady reduction in the general damage from stem rust since the beginning of the campaign.

#### EMERGENCY FUNDS

Project	Obligated, 1938	Estimated obligations, 1939
<u>Emergency Relief Appropriation Act, 1937:</u>		
Barberry eradication.....	\$1,097,400	- - -
<u>Emergency Relief Appropriation Act, 1938:</u>		
Barberry eradication.....	- - -	\$784,000
Total, Emergency Funds.....	1,097,400	784,000



## (p) COTTON INSECTS

Appropriation Act, 1939 ..... \$144,544  
 Budget Estimate, 1940..... 144,544

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)	Increase or Decrease
1. Cotton boll weevil investigations..	\$56,176	\$56,404	\$56,404	
2. Investigations on miscellaneous cotton insects.....	51,436	56,090	60,090	+\$4,000(1)
3. Thurberia weevil investigations....	7,883	4,000	-	- 4,000(1)
4. Pink bollworm investigations.....	27,635	28,050	28,050	
Unobligated balance.....	1,414	- - -	- - -	
Total appropriation.....	144,544	144,544	144,544	- - -

(1) There is no change in the amount requested for this item. Certain adjustments are made in project allotments to provide for an urgent need for additional investigation of certain plant bugs which cause material losses and for which no effective control is available.

## WORK UNDER THIS APPROPRIATION

General.--- This appropriation provides for investigations on insects which attack cotton plants and crude cotton products and for the development or improvement of methods for their control. Cotton is one of the important agricultural crops and one on which the agriculture of the South depends. The products produced from cotton form an important part of industrial occupations in many sections of the United States. Cotton is attacked by many different kinds of insects. The importance of the various species varies with the season and the locality. One of the outstanding pests is the boll weevil. Investigations under this appropriation are carried on in cooperation with the States whenever practicable, but only comparatively few States are engaged in investigations on insects attacking cotton. Those phases of the studies having relation to other activities of the Department are carried on in cooperation with the interested bureaus. The work is directed by the Division of Cotton Insects, with headquarters in Washington, D. C., and field laboratories are maintained in localities favorable for the investigations.

1. Cotton boll weevil investigations.--- This project provides for investigations on the boll weevil, the most important cotton pest in the South, and the development and improvement of measures for its control. The scope of studies under way covers a wide field. Some of the more important lines of work under way are explained in the following paragraphs:





Cage tests are being made to determine the toxicity of new insecticides developed by other units of the Bureau. Similar tests are made for new combinations of insecticides which have been applied. Comparisons are made with the standard, calcium arsenate, and the effect these materials or combinations have on the cotton plant determined. These cage tests are used as the basis for field tests.

New and promising insecticides or combinations of insecticides are tested in the field in comparison with the measures now recommended. The standard insecticide, calcium arsenate, is not satisfactory under all conditions, and field tests are made to determine the possibility of modifying applications or adding other insecticides to each application to improve its effectiveness. The details for the control of the boll weevil differ in various parts of the cotton belt, and accurate information is not available for certain sections as to the most effective time to apply the standard calcium arsenate method to secure effective control. The field studies also include tests to determine practicability of reducing the amount of calcium arsenate in the earlier applications or of eliminating these applications and using instead molasses calcium arsenate mixtures or substitute sulphur or other non-arsenicals. The work is conducted from laboratories in South Carolina, Georgia, Mississippi, and Louisiana.

In certain areas, particularly those along the Atlantic Coastal Plain, calcium arsenate and other arsenicals appear to have a deleterious effect on certain types of soil. Studies are under way to determine the effect that insecticides used for control of the boll weevil have on cotton, forage, or truck crops that may later be planted in these soils.

Certain native parasites are known to attack the boll weevil, and studies are under way in cooperation with various States to determine the seasonal and geographical distribution and abundance of these parasites and to ascertain the relation they may have to other insects and environmental factors. These studies are for the purpose of determining whether it would be practicable to increase control by these natural agencies. In certain sections natural enemies contribute to reducing the weevil to such an extent that artificial control is seldom required. The reason for the effectiveness of various natural enemies in certain sections and not in others is not understood, and studies are under way with the hope of determining the factors which affect the abundance of natural enemies.

Studies are under way to determine the characters of the cotton plant which effect the tolerance or resistance to boll weevil attack. The early development of tough carpel lining in the bolls and the pilosity of the leaves seem to be characters which affect their suitability for oviposition by the weevil and adherence of calcium arsenate used for control. This work is carried on in cooperation with the Bureau of Plant Industry, with main headquarters at Stoneville, Miss.

The boll weevil is apparently largely restricted to cotton, but it will attack certain other malvaceous plants. Studies are under way at several laboratories to determine how important these varieties may be as hosts.



2. Investigations of Miscellaneous Cotton Insects.-- This project provides for investigations on the distribution, life history, and habits of many insects which attack cotton and the development of control measures for those which are particularly injurious. In some sections various native insects are more important as pests of cotton than is the boll weevil, and in all parts of the main cotton belt their control has to be considered and timed in connection with that applied for other pests. Some of the problems now receiving special attention are:

The cotton flea hopper and closely allied insects cause the cotton plant to shed squares. They are very important pests and often cause extensive damage over wide areas. In the Coastal Plain section of Texas the cotton flea hopper is the most important cotton pest. Investigations to determine methods of control by the use of insecticides and by cultural practices are under way. These studies are centered on Port Lavaca, Texas.

The cotton bollworm causes considerable damage to cotton and in many parts of the western section of the main cotton belt is considered the most destructive cotton insect pest. Studies to determine the relation of this pest to environmental factors, the effectiveness of insecticides or repellents to the moth, and the possible value of natural enemies are under way. Its control by insecticides is difficult, because the worms must be killed before they enter the bolls. Much of this work is carried on from the laboratory at College Station, Texas, and is done in cooperation with the Texas Agricultural Experiment Station.

Root aphids are pests of considerable importance in the eastern part of the cotton belt, particularly in the Atlantic Coastal Plain. Studies for control by cultural practices and insecticides are being carried on at Florence in cooperation with the South Carolina Experiment Station. There are at least three species involved, and the host habits, particularly the relation to certain weeds and grasses, have an important bearing on control.

Preliminary investigations indicate that Fusarium wilt of cotton may be disseminated by insects which occur commonly in cotton fields. Studies to determine the part such insects may play in spreading these diseases have been carried on in cooperation with the Texas Agricultural Experiment Station.

At least six different species of true bugs injure cotton, especially in regions where it is produced under irrigation. These pests cause shedding of squares and young bolls and stain the lint, thus materially lowering its quality. Studies to determine the relation of these bugs to their native host plants, and the practicability of controlling the insects by the use of insecticides or cultural means are under way. Much of this work is being carried on in Arizona, with field headquarters at Tucson. Due to a curtailment in investigations on the Thurberia weevil, it is planned to place increased emphasis on this work during the current fiscal year.

Some of the native insect pests of cotton, such as the red spider, leaf perforator, crickets, and flea beetles occur in outbreak numbers periodically and cause important losses over considerable areas. Effective





means of controlling many of these are not known. Studies to determine the life history and habits of these pests and how they can be controlled are under way in the various field laboratories, particularly those at Tallulah, La., Florence, S. C., and Tifton, Ga.

3. Thurberia Weevil Investigations.-- This project provides for investigations of the life history, habits, and development of control measures for the *Thurberia* weevil, the western form of the cotton boll weevil, which is confined to the limited portions of the cotton-growing area of southeastern Arizona and parts of Mexico. This insect is a dry-land form of the cotton boll weevil and has as its native host wild *Thurberia* cotton, which is generally distributed throughout the mountainous regions of the Southwest. This weevil has adapted itself to cotton and is a potential enemy to cotton production in the arid regions. Its habits differ from those of the boll weevil, and in limited areas around Tucson it has demonstrated that it can do material damage to cultivated cotton. Due to the development of effective control measures, the work on this project is now limited to certain field observations to determine the status of the weevil in its native host and to the preparation of reports of investigational work.

Under allotments from emergency funds relief labor is being used to locate and destroy *Thurberia* plants in areas where the weevil occurs, and surveys are made to determine the effect that this work has on the status of the weevil, as to infestation both in *Thurberia* and cotton.

4. Pink Bollworm Investigations.-- This project provides for investigations on the pink bollworm to develop needed facts regarding its life history and habits and improve and develop new control measures which may be used in combating the insect in the limited sections of the United States where it has become established. These investigations will also serve as an insurance by providing additional information regarding means of controlling or eradicating this pest should it become established in new areas. The work is carried on in cooperation with the Texas Agricultural Experiment Station and the Mexican Department of Agriculture, with headquarters at Presidio, Texas. The following paragraphs briefly discuss some of the problems being studied:

Breeding and colonization of introduced parasites. Four parasites have been introduced from Egypt and two from Hawaii. These are being bred in the laboratory at Presidio and colonized in Puerto Rico and the heavily infested sections along the Mexican border in both the United States and Mexico. The more promising of these parasites have only recently been received and the work with them is just getting under way. Incidental studies on native parasites are also carried on as part of this activity.

The use of insecticides. This work is being studied in the laboratory and in the field to determine the toxicity of various materials and the possibility of applying them under field conditions to reduce or control this pest.

Studies on control by cultural means include experiments to determine the effect of plowing and irrigation on the overwintering larvae and to develop machinery which can be used in cleaning the field of crop remnants and the testing





of varieties better suited for planting under pink-bollworm conditions.

Observations on the life history and habits are being made to determine the effect of various conditions on survival and hibernation. These studies are being conducted in a large field cage, where it is possible to control the infestation.

(q) PINK BOLLWORM CONTROL

Appropriation Act, 1939.....\$446,800  
Budget Estimate, 1940.....446,800

PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
1. Pink bollworm control operations:			
(a) Supervision of treatment and movement of cotton or cotton products as required by Federal quarantine on pink bollworm.....	\$121,284	\$149,035	\$149,035
(b) Inspection within regulated area to determine status of pink bollworm.....	22,646	23,000	23,000
(c) Inspection outside regulated area to determine possible presence of pink bollworm.....	73,502	111,000	111,000
(d) Cleanup operation for control and eradication of pink bollworm.....	18,180	97,950	97,950
(e) Vehicular inspection to determine compliance with quarantine on pink bollworm.....	4,957	12,500	12,500
(f) Eradication of wild cotton in Florida for protection against infestation of pink bollworm....	81,148	53,315	53,315
Transfer from "Japanese beetle control", Bureau of Entomology and Plant Quarantine.....	-25,000	- - -	- - -
Transfer from "Screwworm control", Bureau of Entomology and Plant Quarantine.....	- 3,000	- - -	- - -
Unobligated balance.....	3,083	- - -	- - -
Total appropriation.....	296,800	446,800	446,800



## WORK UNDER THIS APPROPRIATION

This item provides for activities concerned with the prevention of spread of the pink bollworm from the infested area, including the enforcement of the Federal domestic quarantine; control operations in the area along the Mexican border contiguous to the infested area in Mexico; eradication activities in isolated points where infestation is detected; inspections to determine presence of the worm; surveys and control operations in Mexico in cooperation with the Mexican Government or local Mexican authorities; and other related work to protect the cotton culture of the United States from this pest.

The pink bollworm is one of the most destructive pests of cotton and is generally established in all important cotton countries except the United States. It occurs only in limited areas in this country but is a potential menace to cotton culture over most of the United States. It is believed extermination of the insect throughout the infested area is possible except for those sections adjacent to sources of infestation in Mexico. Infestations have been eradicated from large areas in Texas, Louisiana, and Arizona. The area in the United States now known to be infested by the pink bollworm includes parts of Arizona, New Mexico, and Texas adjacent to the Mexican border where cotton is grown under irrigation and a few sections of the southern part of Florida where wild cotton occurs.

The quarantine requirements in various parts of the regulated area differ in some details, depending on conditions of infestation. In all areas the seed is sterilized and its handling at oil mills, etc., regulated. In some sections where the infestation is heavy the lint has to be fumigated and compressed before it can be shipped. All the gins, oil mills, and compress and fumigating plants in the infested area have to be supervised to see that they comply with necessary safeguards. All cotton products which may leave the quarantine areas have to be certified. These operations are closely associated with the marketing of the crop, and the work must be handled in a manner not only to afford effective protection against this pest but also to make adequate provision for the orderly handling of the crop. The occurrence of light infestations in the Lower Rio Grande Valley of Texas and in the Santa Cruz Valley of Arizona and the placing of these sections under regulation materially increased these activities and a portion of the increase in this appropriation for the current year was required to supervise the marketing of the crop produced in those areas.

There is need for careful and thorough inspection within the regulated areas to determine conditions of infestation. The regulations enforced differ as between lightly and heavily infested areas, and the determination as to this degree of infestation can best be made by gin trash machines. Their use cannot be replaced by any other form of inspection with equal efficiency and economy. The cost to producers of compliance with the regulations in the sterilization of seed and lint is directly affected by the information obtained from the use of these machines within the regulated area.



The operation of the quarantine depends, of course, upon an accurate knowledge of the distribution of the pest. The fact that the pink bollworm does or does not exist in this country outside the regulated area must be determined for obvious reasons. The cheapest and most efficient way to do this would be through the use of gin trash machines throughout the cotton-growing areas. Since this cannot be accomplished under the appropriation, the alternative is to provide a substitute for gin trash inspection through the collection of bolls from all areas of the main cotton belt. These are kept in preservatives and inspected in laboratories.

The development of machines capable of segregating gin trash, leaving the larvae of the pink bollworm readily exposed to view in an almost negligible quantity of trash, has brought this type of inspection to a point which justified its consideration as an item altogether separate from that of scouting, although it is an essential part of the scouting work. These machines have been improved from year to year and are now mounted on trucks, which enables them to be moved readily from one location to another. Since it is not necessary to tear down and set up the equipment, machines may be moved from gin to gin or locality to locality under their own power as circumstances may require, and the efficiency of the work is greatly increased. The use of these machines at gins in and out of the regulated area furnishes a more comprehensive knowledge of the pink bollworm conditions throughout the entire cotton belt. Inspections with the aid of the gin trash machine furnishes the most positive evidence with respect to the presence or absence of the pink bollworm in a given locality. It is this inspection on which greatest reliance is placed for the finding of infestations of pink bollworm before they have time to become thoroughly established and spread over considerable areas. These surveys are in the nature of insurance and, in order to give the protection necessary, have been extended during the current year.

The laboratory inspection and gin trash inspection are supplemented by a third method of determining the presence or absence of the pink bollworm. This third method consists of field inspection. It is used in areas outside the regulated area where some reason exists for suspecting the possibility of infestation, where it is important to discover this infestation at the earliest possible moment, and where the infestation must be traced to definite fields of growing cotton.

The most heavily infested section in the regulated area is in the Bid Bend area of Texas. Cotton heavily infested with the pink bollworm in Mexico is separated only by a little more than the width of the Rio Grande from growing cotton in the United States, infestation being heavy on both sides. A general program of suppression and control is maintained in this area on the American side of the border. This includes field cleanup and other operations to reduce the infestation and the hazard of spread because of the occurrence of large numbers of moths and worms. To further reduce the infestation in this section and aid in preventing natural spread a portion of the additional funds provided for the current year have been allotted to augment this work. On the Mexican side of the line agricultural officials and growers are watching the progress of the work across the river, and good cooperation is being received, there being a rather general





and concerted attempt to follow the cleanup procedure. The occurrence of the light infestation in the Santa Cruz Valley of Arizona presents a menace to cotton culture in the adjacent sections where an earlier infestation had been eradicated. To eliminate this infestation it will be necessary to carry on cleanup operations in at least some fields, and such work is planned when the crop has been harvested.

The danger of spread by the movement of seed and lint by truck or similar means from the heavily infested section in the Big Bend section of Texas is markedly greater than from the lightly infested sections. To prevent such movement road stations are operated in cooperation with the State on the important roads leaving the heavily infested section.

A very heavy infestation was found in 1931 in wild cotton growing in parts of southern Florida and work was begun to remove this wild cotton which is of no commercial value. At the outset, the wild cotton most accessible to the average resident or tourist was removed first, gradually working back to more remote locations. It is believed that most of the wild cotton has been located. Experience, however, has shown that some of this cotton will sprout from portions of the roots which were not removed, and it also comes from seed remaining in the soil. This necessitates going over the ground several times. Work on the removal and destruction of wild cotton can be done only during the drier seasons. The urgent need for the continuance of this work during 1938 on much the same scale as during the preceding seasons when emergency funds were available led to the transfer of \$28,000 from other appropriations. It will be necessary to continue these activities on much the same scale until the wild cotton has been removed from this area. In keeping with an informal understanding with the Bureau of the Budget, an effort is being made to provide part of the necessary labor from emergency funds.

(r) THURBERIA WEEVIL CONTROL

Appropriation Act, 1939,.....\$2,808  
 Budget Estimate, 1940.....2,808

PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
Enforcement of Thurberia weevil quarantine.....	\$2,774	\$2,808	\$2,808
Unobligated balance.....	34	- - -	- - -
Total appropriation.....	2,808	2,808	2,808



## WORK UNDER THIS APPROPRIATION

This item provides for the administration and enforcement of the *Thurberia* weevil quarantine, which regulates the movement of cotton and cotton products from the two counties in Arizona where this pest is known to occur. The work involves supervising the handling, treatment, and movement of cotton, cottonseed, and other articles likely to carry the *Thurberia* weevil into uninfested regions. The *Thurberia* weevil is a native variety of the Mexican boll weevil and occurs in limited areas in Arizona and parts of Mexico. Under natural conditions this native insect lives on wild *Thurberia* cotton. With the production of cultivated cotton in the area it has become attracted to this crop. The weevil has demonstrated capacity to breed in cultivated cotton and, because of its ability to live under arid conditions, is a menace to cotton grown under semiarid conditions. The expenditures for the enforcement of the quarantine are of a continuing nature and are the minimum required to meet conditions.

The removal of *Thurberia* plants from the uncultivated areas in the region where infestation occurs, which was begun in 1935 with emergency funds, has continued. This destruction of the wild host of the weevil, which is a plant of no economic importance, may reduce the possibilities of infestation in commercial cotton, thus lessening the opportunity for spread. The actual effect that this work may have on the abundance of the weevil is not yet known, and it is not possible to make any immediate modifications in the quarantine requirements to safeguard the spread of the weevil.

## EMERGENCY FUNDS

Projects	Obligated, 1938	Estimated, obligations, 1939
<u>Emergency Relief Appropriation Act of 1937:</u>		
Locating and destroying <i>Thurberia</i> plants.....	\$60,124	- - -
<u>Emergency Relief Appropriation Act of 1938:</u>		
Locating and destroying <i>Thurberia</i> plants.....	- - -	\$60,000
Total, Emergency Funds.....	60,124	60,000



## (s) BEE CULTURE

Appropriation Act, 1939.....\$83,000  
 Budget Estimate, 1940..... 83,000

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
Bee culture and apiary management.....	\$81,954	\$83,000	\$83,000
Unobligated balance.....	1,046	- - -	- - -
Total appropriation.....	83,000	83,000	83,000

## WORK UNDER THIS APPROPRIATION

This item provides for investigations on the habits and management of bees to make the production of honey and wax more profitable and to facilitate the pollination of fruits and vegetables and forage crops by the use of honeybees; and for the issuance of permits and inspections of adult honeybees imported into the United States under the Act of 1922 governing the importation of adult honeybees. This is the only specific appropriation made by the Federal Government which provides assistance or aid to the beekeeping interests in the United States, the annual value of which may be conservatively estimated at \$100,000,000. Only fourteen States carry on investigations in the field of bee culture, and these activities are coordinated with those done under this appropriation. The States look to the United States Department of Agriculture to supply them the necessary information regarding the management of bees, control of their diseases, and their satisfactory and effective handling in the pollination of plants and production of honey and wax.

In the fiscal year 1940 it is contemplated that headquarters may be established for the Division of Bee Culture in Washington, D. C. Headquarters for the work carried on under this item are now maintained at the laboratory at Beltsville, Md., where general investigations are conducted as well as those concerned with problems affecting beekeeping in the Eastern States. Main field laboratories are located at Laramie, Wyo., Baton Rouge, La., and Davis, Calif., and a sublaboratory at Madison, Wis., to investigate problems peculiar to these regions and also study the effect of regional conditions on problems occurring throughout the United States. Investigations on certain special problems are also carried on in cooperation with State agencies in Iowa and Texas.

The activities carried on under this appropriation item are largely interrelated, comprising a number of work projects, which are discussed in the following paragraphs:





Diseased bees or samples of broods from diseased colonies are sent from all parts of the United States to the Beltsville, Md., laboratory for diagnosis. This work is of a service nature and is essential to the beekeeping interests of the United States. Live bees imported into the United States under permits are examined at the Beltsville laboratory to see that they are free from disease and meet the requirements of the law and regulations governing the importation of living bees. The diseases of bees are studied at various laboratories, especially those at Beltsville and Laramie. These investigations include studies on the life history of the diseases, especially para-foulbrood, recently discovered in several Southeastern States, and the means by which they may be combated. Emphasis is now placed on the way diseases may spread through beeswax and honey and the relation of the location of infection to sources of infectious honey. Special attention is directed to the possibility of combating American foulbrood through the development of resistant strains of bees. These special studies are being carried on cooperatively with State experiment stations of Iowa, Wisconsin, Wyoming, and Texas.

Studies are under way at the laboratories at Baton Rouge, La., and Beltsville, Md., to develop improved strains of bees, attention being directed primarily to producing bees which have greater longevity and greater honey-carrying capacity; bees with longer tongues so they will be more effective in the fertilization of plants, such as clover; also bees which will be more hardy in northern climates and strains which will be active under adverse weather conditions.

In cooperation with the Bureau of Agricultural Economics and the economic divisions of experiment stations and State colleges, investigations are under way to secure the necessary information regarding the economic aspects of the beekeeping industry in the Pacific Coast States. The work in California is carried on in cooperation with the economists of the Giannini Foundation and that in Oregon in cooperation with the State agricultural experiment station. Results already obtained will permit a tapering off of this activity during the current year.

Studies are under way to determine the regions producing the most satisfactory honey flora and the time when honey plants are available from the standpoint of honey production. Studies to determine the types of honey produced by various plants are also under way. A limited amount of work is being done to determine the value of honeybees in pollinating certain deciduous fruits. The effect of certain poisonous plants and their relation to beekeeping are also being studied.

The shipment of bees in two-and three-pound packages with queens is a relatively new and rapidly growing industry. Such shipments permit the prompt establishment in Northern States of vigorous colonies at a time when they are most needed for the pollination of various fruit trees. It also permits the strengthening of colonies which have become weakened due to adverse weather conditions occurring in many areas during the winter. Considerable loss has occurred in the shipment of bees, resulting in litigation between the shippers and the express agencies. Investigations are now under way to determine the best methods of handling colonies to develop



satisfactory shipping containers and food that may be used in transit, as well as methods of caring for the packages at destination or at transfer points.

Limited attention is given to a number of other problems to develop at least preliminary data needed in relation to the work on other activities. One of these has to do with colony population and another with the effect of a reserve supply of pollen. Work on this last problem is being increased somewhat during the current year. Studies on beeswax are carried on in co-operation with the State agency in California. Investigations are also conducted on the superseding of queen bees, a troublesome problem entailing severe losses to beekeepers.

(t) INSECTS AFFECTING MAN AND ANIMALS

Appropriation Act, 1939.....\$191,100  
Budget Estimate, 1940.....191,100

PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
1. Investigations on insects affecting man.....	\$52,312	\$66,723	\$66,723
2. Investigations on household insects.....	14,475	14,475	14,475
3. Investigations on insects affecting animals.....	109,351	109,902	109,902
4. Investigations on insects affecting poultry and wild-life.....	3,600	- - -	- - -
Unobligated balance.....	2,862	- - -	- - -
Total appropriation.....	182,600	191,100	191,100

WORK UNDER THIS APPROPRIATION

General.---This item provides for investigations on insect pests attacking man or injuring him by carrying diseases, including those insect pests which annoy him in his habitation or destroy household supplies, fabrics, etc. It also provides for investigations on insect pests of farm and range animals, poultry, birds, and wild birds and animals and the development of methods for their control or eradication. Activities are carried on independently or in cooperation with the Public Health Service, Bureau of Animal Industry, and Bureau of Biological Survey. The Bureau of Entomology and Plant Quarantine is, however, responsible for the investigations on insects.



1. Investigations on Insects Affecting Man.--The work under this project is concerned with investigations on insects which annoy man by direct attack or injure him by carrying diseases. Only a few of the more pressing problems are now being studied. The most important of them are explained below:

Mosquitoes as a class are the most important insect pests known to man. They are responsible for carrying such dreaded diseases as yellow fever, malaria fever, dengue fever, etc. There are many different kinds of mosquitoes, and no one control measure is equally effective for all kinds. The habits of some of the commoner forms are fairly well known and means of control have been developed. The habits of many kinds are known only in a general way and effective controls are not available. Even with the commoner forms methods of control depend on various local conditions. The planning for control campaigns requires technical assistance and at present the requests for advice can only be partially met. The studies under way are conducted from Portland, Oreg., Savannah, Ga., and Orlando, Fla. Those in the Pacific Northwest are concerned largely with forms in flood water and those in Georgia and Florida with salt marsh forms, although in Florida attention is also being given to the group of mosquitoes which obtain their air through plants rather than coming to the surface of the water. Salt marsh mosquitoes are responsible for heavy losses to agriculture, fishing, and industrial activities and especially in retarding the development of resort areas on the Atlantic and Gulf coasts. Large sums are being spent in attempts to control these pests and to develop more effective control measures, including measures which will not adversely affect wildlife. The completion of work under the project for the investigation of poultry and wildlife insects has made it possible to intensify the activities on mosquitoes during the current fiscal year.

Sand flies are not definitely known to carry diseases. They are, however, of prime importance to man in certain sections of the country, particularly along the southeast seaboard. Investigations under way are headquartered at Savannah, Ga., although some studies are also being made in Florida. The habits of only a comparatively few species of sand flies are known and for some of these no effective control measures are yet available. It is, however, now possible to suggest control measures that will materially reduce the numbers of certain species. The value of these methods should be further tested and ways devised to combat those living in trees and along streams and to determine the effect of pumping out diked areas.

Eye gnats are extremely annoying to man and livestock and also transmit a dangerous eye disease which is especially common among children of school age. These pests are particularly troublesome in parts of the Southern States, and surveys are being conducted there, as well as in the winter garden area of Texas, to determine their distribution and factors favoring breeding.

The development of safe and economical methods of rearing and transplanting sterile maggots for surgical use has been investigated and ways of safe handling developed. Certain materials, namely allantoin and





urea, found in the excretions of blowfly maggots have a beneficial effect on suppurating wounds and other disease conditions. Excretions of other species of insects are irritating or poisonous to man and animals, and these are being investigated.

Certain ticks, including the common dog tick, transmit Rocky Mountain spotted fever. Studies are under way to determine the habits of these and other kinds of ticks so as to determine facts which may aid in developing methods for their control. Investigations on dog ticks in New England in the vicinity of Martha's Vineyard, which were begun last season, are being continued with a view to the development of effective control measures.

Work has been started with funds appropriated in the 1939 act on gnat investigations in the vicinity of Clear Lake, California, where a particularly troublesome situation exists.

2. Investigations on Household Insects.--This project provides for investigations of insect pests in dwellings, hotels, etc., those annoying householders, and those destroying household supplies, drugs, fabrics, etc., and the development of methods for their control. There are many kinds of insects which annoy man or destroy his household possessions. The habits of these differ greatly. The habits of the same species may even differ under various conditions of artificial environment. The development of control measures is complicated because of the wide variety of conditions under which the pests occur. Special attention is now being given to the development of more effective methods of control by fumigation, the use of safe fumigants, and the determination of conditions under which various fumigant materials may be used. These studies also involve determining the effect proposed controls may have on products in storage, households, stores, etc. Investigations of various chemicals for the mothproofing of various materials are also under way.

3. Investigations on insects affecting animals.--This project provides for investigations on insects injurious to horses, cattle, sheep, goats, swine, and other domestic animals, as well as game animals, and the development of methods for their control.

Screwworms are pests of cattle, sheep, goats, and various other animals, causing immense losses, particularly under range conditions. The studies conducted with allotments from regular funds are carried on at field laboratories in Texas and Georgia. About 90 percent of the screwworm infestations are caused by the species rather recently differentiated, which restricts its breeding to live animals. The habits of this species are different from those of the composite species, and more intensive studies are necessary to develop fully effective controls. The work in Texas involves the handling of some 800 head of livestock in experimental work under ranch conditions.

The larvae of certain flies commonly known as cattle grubs not only greatly injure hides but materially interfere with the effective management of dairy and range cattle. The annual losses from these insects are estimated as high as \$50,000,000. Studies of methods for controlling these pests are under way.



The larvae of certain flies commonly called horse bots cause serious injury to horses and related animals and also greatly reduce their efficiency. More complete information on the habits of these pests and methods of preventing infestation are particularly needed. During the past year, however, work on this project has been devoted to the factor of insect transmission of infectious equine encephalomyelitis. This was necessary because of a very serious outbreak of this disease in the Central States and parts of the South and West.

The sheep head bot materially lowers the vitality of the infested animal and in many cases causes its death. Goat lice do a great amount of injury to the hair, particularly mohair, and also reduce the vitality of the animals. The losses caused by these pests to sheep and goat raisers are great, and there is an insistent demand for effective control measures. Experiments to determine the value of certain volatile materials and sulphur are under way, but the effect of these possible treatments on the animals and insects needs further study.

Many of the fly sprays now used on farms to protect livestock, particularly dairy cattle, are valueless and some of them are even detrimental to cattle and dairy and other food products. Investigations are now under way to develop a more effective and cheaper spray. If successful, this work will be of material aid to the livestock and dairy industry, and besides controlling flies will tend to reduce the opportunity for disease.

A number of species of ticks are detrimental to animals. Wounds caused to cattle by some ticks, such as the common ear tick, provide entrance places for other pests such as screwworms. Information on the distribution and habits of these species is not well known and no satisfactory control measures are available for several important species.

4. Investigations on insects affecting poultry and wildlife.--This project provides for investigations on insect pests and mites which attack poultry and wildlife. Studies which have been conducted have developed measures for the control of certain of the more important insect pests of poultry. It was considered advisable therefore, to terminate this project at the end of the fiscal year 1938.



## (u) INSECT PEST SURVEY AND IDENTIFICATION

Appropriation Act, 1939.....	\$149,790
Budget Estimate, 1940 .....	<u>159,790</u>
Increase .....	<u>10,000</u>

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)	Increase
1. Insect pest survey.....	\$18,876	\$19,559	\$19,559	- -
2. Identification and classification of insects	139,781	130,231	140,231	+ \$10,000 (1)
Unobligated balance.....	1,133	- -	- -	- -
Total appropriation....	159,790	149,790	159,790	+ 10,000

## INCREASE

(1) An increase of \$10,000 is requested in this item to provide for the salaries of subject-matter specialists in insect identification work.

Probably no unit of the Bureau is engaged in more important work than this Division. Both the research and control divisions are dependent, to a very high degree, upon the determinations made by this Division for the effective conduct of their work. There are many hundreds of thousands of different kinds of insects. Many of them have a superficial resemblance to one another, and it is only through the determinations made by experts in the field of identification that it is possible to make the differentiations so necessary to the specialists engaged in various phases of research and to the units engaged in quarantine or control activities. For a number of years the Division of Insect Identification has lacked the funds necessary even to keep abreast of its routine identification work, and under these conditions it has, of course, been extremely hard to carry on the basic research work necessary to the further division of major classifications and to the establishment of relationship between the various species. The appropriation for the fiscal year 1938 provided an increase in this item which was very helpful in expediting certain phases of the identification work, particularly in the field involving thrips, ants, and coleopterous larvae. However, despite this advantage and the continued efforts of the staff, which has worked many hours overtime, the program of the division is still far from current, and the proposed increase, which would simply restore a reduction made in this item for the fiscal year 1939, is urged if the ground gained is to be held.





## WORK UNDER THIS APPROPRIATION

General.--The work prosecuted under this item is essential to the various activities of the Bureau and involves identification of specimens and the recording and distribution of facts regarding the prevalence and abundance of economic insect pests. The activities are grouped under two projects, as follows:

1. Insect Pest Survey.--These activities are concerned with (a) the assembling, recording, analysis, and maintenance of permanent records on insect abundance and damage; (b) the maintenance of records of the occurrence and distribution of insect pests in foreign countries--information necessary in connection with the enforcement of quarantines regulating the entry of plants and plant products; and (c) the publication of a monthly bulletin on current insect conditions and an annual summary of the conditions which occur throughout the United States.

Information on insect conditions throughout the country is supplied through cooperative arrangements with entomologists of the Bureau and State entomological agencies. These cooperators furnish notes on the occurrence and relative abundance of insect pests in their respective regions. The assembling and redistribution of current information on insect conditions is of importance to the Bureau but is also useful to State workers in forewarning them of menacing insect conditions occurring in neighboring areas.

2. Identification and Classification of insects.--This project is of a continuing and service nature of vital importance to economic entomology. It includes the identification, classification, and description of insects in both the adult and immature stages. Accurate and authoritative information on the identity and relationships of insects is required in the daily work concerned with research on insects, with control activities, and with the enforcement of plant and animal quarantines. Without this information it would be impossible to conduct many of these activities in an effective manner. The prompt recognition of the numerous insect pests is essential and this can be done only by specialists. This activity plays an important part in the economic work on insect pests carried on by other governmental agencies, State agricultural colleges and experiment stations, universities, etc., in this country and elsewhere. In connection with these activities investigations are also carried out on the anatomy and structure of insects. The proper understanding of the characters by which the hundreds of thousands of kinds may be distinguished is essential.



## (v) FOREIGN PARASITES

Appropriation Act, 1939.....\$38,000  
 Budget Estimate, 1940..... 38,000

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
Foreign parasite introduction.....	\$37,590	\$38,000	\$38,000
Unobligated balance.....	410	- - -	- - -
Total appropriation.....	38,000	38,000	38,000

## WORK UNDER THIS APPROPRIATION

This appropriation provides for administrative expenses connected with the introduction of natural enemies of injurious insects and related pests and for the exchange with other countries of useful and beneficial insects. This includes operating expenses of a laboratory in the United States which serves as a receiving center for the natural enemies imported from foreign countries and for the expenses of maintenance and operation of field laboratories in foreign countries which serve as a center for exploration to locate useful, beneficial insects and activities associated with their assembling for shipment to the United States.

The value of natural enemies as aids in controlling injurious insect pests has been amply demonstrated by work done over a period of many years. The use of natural enemies as possible aids in combating insect pests is a definite part of investigations to develop means for the control of injurious forms, particularly those which are not native to the section where they cause damage. Many of the major insect pests of the United States were introduced with the early development of agriculture. Except in a few instances their natural enemies did not accompany the introductions. Studies of their natural enemies and their native habitat and their collection and assembling for shipment to the United States require especially trained personnel and many contacts with the appropriate officials in foreign countries. To do this it is necessary to maintain laboratories with appropriate facilities in foreign countries. At present there are two such field laboratories, one in Europe and the other in Japan. It is also necessary that appropriate facilities and trained personnel be available in the United States to receive shipments of natural enemies and hold them under quarantine conditions to assure the absence of injurious insects before they are released in the United States. The insects for which natural enemies may be sought attack a wide variety of crops.



The expenses connected with the importation of parasites, other than those of a recurring and administrative nature, are provided for from the appropriations made for studies and prevention of spread of particular pests.

(w) CONTROL INVESTIGATIONS

Appropriation Act, 1939.....\$72,518  
 Budget Estimate, 1940..... 72,518

PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
Control investigations.....	\$69,537	\$72,518	\$72,518
Unobligated balance.....	2,981	- - -	- - -
Total appropriation.....	72,518	72,518	72,518

WORK UNDER THIS APPROPRIATION

This appropriation provides for investigations to develop new materials which may be useful for the control of insect pests; research concerned with the commercial application of methods developed for the sterilization or disinfection of plants or plant products; and the coordination and standardization of methods of disinfection of articles or products the movement of which is regulated by various plant quarantines. The basic information secured by these investigations is applicable to many lines of work on the control of plant pests. The studies provided for have an intimate relation to much of the research, control, and quarantine enforcement work of the Bureau and may cut across crop and divisional lines. In such cases the work is cooperative and closely coordinated with that done by other units. The activities concerned with the sterilization or disinfection of quarantined articles include investigations to develop methods, by fumigation, the use of heat, and other means, which will permit freer movement of the regulated articles without endangering the spread of pests.

The various lines of investigation have many related aspects and are grouped under one project. The more important activities now under way are discussed briefly in the following paragraphs:

Investigations to determine the application, under varying conditions, of gaseous insecticides in the destruction of insects of economic importance are concerned primarily with methods of commercially applying fumigants for the treatment of products covered by quarantine regulations. These studies aim to develop treatments by fumigation which will make it possible to treat products the movement of which is now prohibited or restricted by quarantines





so that they can be imported or moved interstate without accompanying risk of spreading infestations of insects which are the subject of quarantine.

Certain insect pests which may occur in many of the products regulated by quarantine can be killed by the use of heat or cold, and this method of sterilizing plants or plant products is used in connection with certain Federal quarantines. The commercial application of these methods requires constant technical supervision and standardization. An important part of the work carried on under the project consists of furnishing this type of service to the unit responsible for the enforcement of the quarantine. Certain pests not regulated by quarantine may be combated by the use of heat and cold. Experiments to determine the effect of heat or cold on insects, and especially those forms that may be moved in connection with commercial shipments, are carried on in cooperation with other divisions of the Bureau.

With the development of new insecticides there is need to determine effective ways of applying new materials. Studies on the development of machinery or equipment used in applying insecticides are a part of the activities which come under this project. At present most of the attention is devoted to the modifying of machinery in applying insecticides used in control operations against certain major pests such as the gypsy moth. These and related studies are carried on in cooperation with other divisions of the Bureau.

An important part of the work under this project consists of testing new materials to determine their effect on insects. New materials developed by the chemists are tested under laboratory conditions on various types of insects and plants to make a preliminary determination of the effect of new compounds on the insects on plants. The materials tested include not only those synthesized by the chemists but also the extracts of various plants thought to contain properties of insecticidal value. These studies go hand in hand with the investigations on the chemistry of insecticidal materials and form the bases for suggestions for new materials or methods that may be useful against particular crop pests. Materials which promise to be of value are given further tests at field laboratories concerned with the control of the insects for which they may be applicable. Two kinds of insects, which can be made available in large quantities throughout the year and are particularly susceptible to poisons, are used in these tests. These are mosquito larvae and the southern army worm. In addition to testing material developed by the chemists, these laboratory tests are intimately associated with the activities concerned with the development of strains or varieties of plants which contain insecticidal properties. The breeding work of the Bureau of Plant Industry to develop strains or varieties of the native plant known as devil's shoestring (Cracca virginiana) to increase the amount of the active insecticidal properties must be correlated with tests on insects to determine the toxicity of these materials.

A thorough knowledge of the normal physiology of insects is a necessary basis for studies to determine the effect that various kinds of poisons may have on the insect. Physiological studies and investigations on insects are a part of the activities carried on under the project and involve studies to determine the relation of insects to external and internal environmental



factors. These serve as a basis for determining the lethal action under abnormal conditions such as temperatures, poisons, etc.

Studies to determine the toxic effect of insecticides on insects include a group of related problems considered under this project. The object of studies of this nature is to determine the effect on insects of various compounds and to ascertain the lethal dosage of insecticides under varying conditions of temperature and humidity.

Tobacco has long been recognized as one of the standard insecticides. Studies are now under way to determine the possibility of using various forms of insecticides made from tobacco as stomach poisons as well as contact poisons. These activities are carried on in cooperation with the chemists and include not only studies on tobacco extracts themselves but also the possibility of mixing them in a more effective manner with other materials which would serve as carriers.

#### (x) INSECTICIDE AND FUNGICIDE INVESTIGATIONS

Appropriation Act, 1939.....	\$123,984
Budget Estimate, 1940.....	140,000
Increase.....	<u>16,016</u>

#### PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)	Increase
Chemical investigations on insecticides.....	\$148,718	\$123,984	\$140,000	+ \$16,016(1)
Unobligated balance.....	266	- - -	- - -	- - -
Total appropriation..	148,984	123,984	140,000	+ 16,016

#### INCREASE

(1) The increase of \$16,016 in this project for 1940 is urged to provide for important chemical investigations on insecticides. The \$16,016 will be used for investigations as follows:

(a) An increase of \$10,016 for investigations on the toxic constituents of insecticidal plants. Certain of the most important insecticides now being used for the control of some insect pests are derived from plants such as tobacco, derris, cube, and pyrethrum. Much improvement has been made in the products derived from these plants and they are finding wider use. In testing the use of these products (the residues of which have little health hazard) for the control of insects, entomologists of other divisions of the Bureau encounter many chemical problems which require investigations by chemists. An important phase of the investigations on insecticidal plants is



the consultation work of service to other divisions on chemical problems which arise in tests to determine the use of these materials.

There are many plants which are toxic to insects, the investigation of which will, it is believed, lead to the isolation of the toxic substance, thus making it possible to develop standard insecticides from them. Certain of these plants can be produced in large quantities in the United States without competition with other agricultural products. Investigation of these should not only develop new insecticides which do not leave objectionable residues but may also develop crops which can be profitably produced in certain sections of the country. The discoveries of recent years emphasize the importance of concerted chemical studies on plants which have insecticidal properties. These investigations have an important bearing on the discovery of insecticidal materials which do not leave objectionable spray residues.

(b) An increase of \$6,000 for investigations on fumigants for control of insect pests of stored grain. The reduction in funds for 1939 required the complete cessation of the chemical work under way at the Manhattan, Kansas, laboratory. This laboratory is maintained for a study of the control of insects infesting stored grain, and the work of the entomologists there is greatly crippled by their lack of chemical assistance in keeping track of gas concentrations, in studying the penetration of fumigants into different materials and their sorption therein, and in devising new fumigants and means of handling them. Inasmuch as fumigation is one of the most effective methods of controlling stored grain insects, any interference with the progress of this work reflects itself in serious economic losses. It is proposed to reestablish this work on the old basis.

#### WORK UNDER THIS APPROPRIATION

This item provides for investigation to develop insecticidal materials for the control of insect pests and for the development of effective attractants or repellents which may be used to aid in combating insects. Particular attention is directed to insecticides which are less hazardous to users and less poisonous to anyone eating sprayed or dusted fruits and vegetables. The improvement of existing insecticides by detailed study of their physical and chemical properties is also under way. Investigations to originate and improve methods of analyzing insecticides and to devise cheaper methods of manufacture are activities which come under this project. The determination of the most effective chemical means of removing harmful spray residues from fruits and vegetables that have been treated with compounds containing arsenic, lead, copper, fluorine, or other insecticidal and fungicidal materials is also an important phase of the work. The studies under way are included under a number of work projects referred to in the following paragraphs:

Some of the most useful insecticides--for example, pyrethrum, nicotine, derris, and cube--are natural products of plant life. It is believed that there are many other plants which have insecticidal properties of value. The activities under this work project aim to discover such plants, study the constituents to which the toxicity is due, and develop useful insecticidal properties of known merit. Special attention is being given to derris, cube, and pyrethrum. An effort is being made to determine





ways of preventing the decomposition of effective insecticidal properties of extracts of derris and cube and to study the relationship of the active insecticidal principles of these plants, such as rotenone and deguelin. Study is being made of certain native plants to determine those which contain considerable quantities of rotenone and other active ingredients.

Investigations are under way to develop organic compounds which have insecticidal properties but leave residues relatively noninjurious to warm-blooded animals or man. Hundreds of organic compounds have been obtained or synthesized. Special attention is being given to the synthesis of organic compounds containing sulphur and to methods of using phenothiazine or derivatives that may be prepared from it.

Investigations of various chemical problems connected with the removal of spray residues are closely coordinated with investigations carried on in other units of the Bureau and in the Bureau of Plant Industry. An effort is being made to develop chemical methods for removing objectionable residues. Analyses are made to determine the amounts of residues resulting from various spray formulae. Work includes not only studies on apples but also studies on other fruits, such as peaches, grapes, berries, and certain vegetables such as cabbage. In addition to determining the residues which result from the use of insecticides such as the arsenicals, attention is also being given to the determination of methods of determining residues from organic compounds such as derris.

Studies on inorganic insecticides are directed to the improvement of common inorganic insecticides and the development of possible new combinations which have desirable characteristics. By far the larger part of insecticides used belong to the inorganic group. Many of these are effective against the insect but are more or less injurious to the foliage. The reaction of these materials is variable, and insecticidal properties may be improved and modification made in their manufacture. Other materials may be developed by improving their physical properties. Calcium arsenate is being intensively studied to determine basic facts regarding it.

Chemical investigations on fumigants aim to develop new methods of using well-known chemical compounds for fumigation of growing material or stored products to increase their efficiency and reduce the cost of operations. Chemical investigations on fumigants also aim to find new compounds which may be used as fumigants to determine the correlation between their chemical constituents and the toxicity to various insect pests. These activities are closely correlated with those of other units in the Bureau. Special attention is being given to fumigants that may be effectively used for the control of the resistant form of the California red scale of citrus.

The application of insecticides requires the use of substances which act primarily as carriers. Studies are under way to determine the composition, characteristics, and uses of a large class of materials



which in themselves have no insecticidal properties but are used in conjunction with insecticides to improve their application. Materials of this class include those added to improve the distribution of insecticidal dust and those used to increase the wetting, spreading, penetrating, and adhesive properties of sprays. As a part of this activity a study is being made of stabilizers to protect various materials from the effect that weather conditions may have on their toxicity. A wide variety of products is studied in connection with these activities.

Goldfish respond to many poisons in a manner similar to many insects. They can be maintained throughout the year in the laboratory and are readily available as test animals. By using them in initial tests, studies to develop new plant materials and organic compounds which may be used as insecticides are expedited. Goldfish are now used largely to obtain information on the question of the correlation between toxicity and the chemical composition of certain compounds such as phenol and its derivatives, with particular emphasis on the derivatives of thiophenol.

In carrying on both the investigational and control activities of the Bureau there is need to have many materials analyzed so their constituents will be known. The chemical activities of this type are primarily of a service nature but include the analyzing of samples of miscellaneous insecticidal materials to determine whether they meet specifications and the determination of the constituents of materials tested by various laboratories of the Bureau, and hence usually have a definite bearing on research.



## (y) TRANSIT INSPECTION

Appropriation Act, 1939.....	\$44,059
Budget Estimate, 1940 .....	<u>44,059</u>

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
Transit inspection.....	\$43,360	\$44,059	\$44,059
Unobligated balance.....	699	- - -	- - -
Total appropriation.....	44,059	44,059	44,059

## WORK UNDER THIS APPROPRIATION

This appropriation provides for the inspection in transit of articles regulated by plant quarantines to determine if they are being transported in violation of such quarantines. The only means by which the Department can be assured that safeguards required under plant quarantine regulations are being followed in the case of mail, express, and freight shipments is to maintain a system of inspecting these products while in transit. This work consists of checking such shipments at important railway centers and transfer points to intercept articles which may be moving in violation of the quarantines. The prompt discovery of any weakness in inspection or certification makes it possible to correct faults or add necessary safeguards for the prevention of the establishment of pests at points far removed from the infested area. Experience has shown that when the Department fails to check shipments at railroad centers and transfer points uninspected, untreated, or uncertified products, which may be infested, are transported by common carriers into uninfested areas and thus threaten the establishment of these pests in such areas. The transit inspection service not only turns back several thousand packages every year, but it also serves to keep the employees of common carriers informed of quarantine requirements and thus obtains their active support in cooperating with the Department in its enforcement of Federal quarantines. The value of this work is indicated by a steady decrease in the ratio of violations to shipments.





## (2) FOREIGN PLANT QUARANTINES

Appropriation Act, 1939..... \$680,000  
 Budget Estimate, 1940..... 680,000

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
1. Import and permit service for issuance of permits for the importation of plants and plant products to comply with plant quarantines.....	\$57,058	\$58,348	\$58,348
2. Inspection at ports of entry of plants and plant products regulated by plant quarantines.....	618,678	621,652	621,652
Unobligated balance.....	4,264	- - -	- - -
Total appropriation.....	680,000	680,000	680,000

## WORK UNDER THIS APPROPRIATION

General.---This appropriation provides for administering various quarantines and regulatory orders to prevent the entry into the United States from foreign countries, Puerto Rico, and Hawaii of injurious insects and plant diseases by controlling and safeguarding the entry of plants and plant products. These activities include the enforcement of (1) foreign plant quarantines and regulatory orders issued under the Plant Quarantine Act of 1912, as amended; (2) rules and regulations governing the entry into the United States of railway cars and other vehicles, etc., from Mexico; (3) the Act of 1905 governing the importation of living insects into the United States; and (4) regulations governing the shipment of plants and plant products to the mainland from Hawaii and Puerto Rico.

The operations divide into two groups. One is concerned with authorizing the importation of plants and plant products which may enter the United States under the quarantines and regulatory orders. The other deals with inspections at ports of entry to detect and exclude dangerous plant pests and to see that plant material imported under permit meets the requirements of the authorization.

1. Import and permit service for issuance of permits for the importation of plants and plant products to comply with plant quarantines.---This project provides for the issuing of permits authorizing the entry of plants and plant products which can be imported without introducing dangerous



plant pests. It is necessary to limit the entry of plants and plant products to those which present the least pest risk or to those which may be adequately safeguarded. Plants and plant products imported into this country from abroad come under permit which gives a record of volume, nature of contents, and destination and point of origin. Material accompanied by permits issued in advance is later inspected to determine that the requirements have been fulfilled. These inspections and, if necessary, disinfection or rejection take place usually at the port of entry, except in the case of nursery stock which is inspected at certain designated points where facilities exist for the care of living plants during their inspection. The issuance of permits requires a large amount of correspondence and the making and maintenance of records. The work is done for the greater part in Washington.

2. Inspection at ports of entry of plants and plant products regulated by plant quarantines.--This project provides for inspection of plants and plant products at ports of entry to protect the United States from injurious insects and plant diseases. This includes work at the maritime ports of entry, the principal Mexican border ports of entry, the principal ports of entry along the Canadian border, in Puerto Rico, Hawaii, and in the District of Columbia. It provides for the District of Columbia inspection service in order that domestic plant material entering or leaving the District may be inspected and certified to meet the requirements of States to which it is consigned and inspection and certification for that plant material imported and distributed by the United States Department of Agriculture. It also provides for the inspection and certification for movement to the mainland of plants and plant products permitted from the territory of Hawaii; and for the protection of Puerto Rico against the entry from foreign countries of injurious insects and plant diseases, and for preventing the movement to the mainland of injurious insects and plant diseases known to occur in Puerto Rico. The various activities involve (1) the inspection of ships, airplanes, railway cars, automobiles, and other vehicles, mail packages, passengers' baggage, ships' stores, and the belongings of travelers entering this country at border ports of entry from Mexico; (2) the inspection of materials entered under permits; (3) the inspection of certain classes of plants in the field, following initial inspections at ports to assure absence of disease or pests which cannot be detected by one inspection; (4) the inspection of plant-introduction gardens maintained by the Bureau of Plant Industry; (5) the supervision of treatments of plants, plant products, or other articles which may be required as a condition of entry; and other activities necessary to carry out the purpose of the project.

This work includes the fumigation of freight cars entering the United States from Mexico. A charge is made of \$4 per car, resulting in treasury receipts of \$41,204 during the fiscal year 1938.



## (aa) CERTIFICATION OF EXPORTS

Appropriation Act, 1939..... \$31,862  
 Budget Estimate, 1940..... 31,862

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
Certification of exports.....	\$31,592	\$31,862	\$31,862
Unobligated balance.....	270	- -	- -
Total appropriation.....	31,862	31,862	31,862

## WORK UNDER THIS APPROPRIATION

This item provides for inspection and certification of fruit or other plant products to meet the sanitary requirements of the countries to which it is intended the products will be shipped. The inspection made is that necessary to issue the certificate required by the country of destination as a condition of entry. The work is carried on at various ports from which the products may be shipped. It is a service to American exporters, for which a nominal fee is charged. This fee is, however, not sufficient to make the project self-supporting. Ninety-one foreign countries now are requiring inspection and certification with respect to the presence of insects and plant diseases on fruit or other plant products imported from the United States. The American exporter is required to furnish a certificate indicating freedom from dangerous insect pests and plant diseases. If American growers are to maintain their markets in foreign countries having these requirements, it is necessary that all such shipments be carefully inspected. A charge of \$1. is made for each certificate issued, resulting in Treasury receipts of \$8,711 for the fiscal year 1938.

## (bb) SCREWORM CONTROL

There was no appropriation made for this item in the Budget for the fiscal year 1939, and nothing is estimated for 1940. The appropriation for the fiscal year 1938 was provided to enable the Bureau to keep in touch with the screwworm situation in livestock and follow up on the intensive educational campaigns carried on in 1936 and 1937.





(cc) CONTROL OF EMERGENCY OUTBREAKS OF  
INSECT PESTS AND PLANT DISEASES

Appropriation, 1939 (Second Deficiency Act, 1938,  
Approved June 25, 1938).....\$700,000  
Budget Estimate, 1940.....- - -  
Decrease.....700,000

## PROJECT STATEMENT

Projects	1938 Obligations	1939 (Estimated)	1940 (Estimated)	Decrease
Incipient and emergency out- breaks of plant pests....	\$2,875,593	\$1,028,046	- - -	-\$1,028,046
Previous year appropriation obligated in 1938.....	- 441,516	- - -	- - -	- - -
1938 appropriation obligated in 1939.....	564,000	- 564,000	- - -	+ 564,000
Reserve for contingencies..	- - -	235,954	- - -	- 235,954
Unobligated balance.....	1,923	- - -	- - -	- - -
Total appropriation..	3,000,000	700,000	- - -	- 700,000(1)

## DECREASE

(1) The Budget for 1940 includes no request for an appropriation under this item. It is expected, however, that an estimate of funds required to carry out the purpose of the authorizing legislation for the season of 1939 will be submitted for consideration in connection with funds provided by the Deficiency Appropriation Act. It is generally recognized that information that may be assembled regarding the status of plant pests which may occur in emergency outbreaks, such as grasshoppers, Mormon crickets, chinch bugs, the white-fringed beetle, etc., during the season when they are active gives a reasonably satisfactory basis on which an estimate of funds may be made. Such information is not available until late in the fall and considerably after the time when regular estimates are prepared. It is also recognized that plans and operations for the control of incipient and emergency outbreaks of plant pests have to be made and carried out on the basis of crop rather than fiscal years. For effective work, funds that are provided should, therefore, be available early in the calendar year.

## WORK UNDER THIS APPROPRIATION

Work under this appropriation is conducted on the basis of a crop season rather than a fiscal year. It is therefore not practicable to report on the work done under this item on the basis of a fiscal year. The following briefly summarizes the activities which have been conducted with funds



made available under the authorization for the control of incipient and emergency outbreaks of plant pests. None of the appropriations made under this authorization have been carried in regular Acts providing funds for the Department. The language providing some of these appropriations has required that special reports be prepared and submitted to Congress. One such report was submitted in January, 1938, and another will be submitted early in January, 1939.

Public Resolution No. 20, 75th Congress, authorized an appropriation of \$2,000,000 for the control of incipient and emergency outbreaks of insect pests and plant diseases, including grasshoppers, Mormon crickets, and chinch bugs. It also authorized that the funds appropriated should remain available until expended and the appropriation of such additional sums as might be necessary to replenish the fund to its original amount at the beginning of each fiscal year. Public Resolution No. 91 (75th Congress) amended this legislation by removing the limitation of \$2,000,000 and authorizing the appropriation of such amounts as might be necessary. Four appropriations have been made under these authorizations, as follows: Two of \$1,000,000 each, the first by Public Resolution No. 26, approved April 27, 1937, and the second by Public Resolution No. 55, approved July 17, 1937; one of \$2,000,000 by Public Resolution No. 81, approved March 2, 1938; and one of \$700,000 by the Second Deficiency Act, fiscal year, 1938. The first two appropriations expired with June 30, 1938; the latter two remain available until June 30, 1939.

The great part of the funds provided by these appropriations have been used to enable the Department to cooperate with States in combating a widespread outbreak of grasshoppers. The funds have, however, made it possible to take active measures against a newly established pest, the white-fringed beetle. During the early months of 1937 and again in 1938, army worms appeared in outbreak numbers in certain States. These pests can be controlled in much the same manner as the grasshoppers by the application of poisoned bait. A small amount from the appropriations was used for the purchase and transportation of bait materials distributed to and used by cooperating States to combat army worms. During 1937 an allotment was also made to combat outbreaks of Mormon crickets in North Dakota and South Dakota. This was the first time that the latter pest had occurred in outbreak numbers in these two States. Work on control of Mormon crickets was then under way in other States financed from allotments from emergency funds provided for relief. The period during which effective work could be done on Mormon crickets was short and the funds allotted from the emergency relief appropriation were not available for work in North and South Dakota. A small amount was also allocated for work to control Mormon crickets in States where the control work had not been provided for by allotments from emergency funds. In the season of 1938 allotments were made for Mormon cricket control work in the Intermountain States. In July, 1937, an incipient outbreak of the white-fringed beetle was outlined in limited parts of Alabama and Florida. This insect is a native of South America and was not previously known to occur in the United States. It attacks a wide variety of crops and has demonstrated that it is a potential pest of major importance over a wide area. It has



since been found in other regions in these States, and in Mississippi and Louisiana, and allotments of funds for its control have been made from this appropriation.

### CHANGE IN LANGUAGE

#### UNDER PARAGRAPH "TOTAL, BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE"

It is recommended that the language of this paragraph be amended by substituting for the word "Total" the following:

"In all, salaries and expenses, to be accounted for as one fund"

For explanation of this change see general note in these Justifications under Office of Experiment Stations, page 54.

### SUPPLEMENTAL FUNDS

Projects	Obligated, 1938	Estimated obligations, 1939
<u>Emergency Relief Appropriation Act, 1936:</u>		
General administrative expenses.....	\$47,141	- - -
<u>Emergency Relief Appropriation Act, 1937:</u>		
Locating and destroying Thurberia cotton plants.....	60,124	- - -
Barberry eradication.....	1,097,400	- - -
Mormon cricket control.....	258,208	- - -
Eradication of Dutch elm disease.....	2,803,220	- - -
White-pine blister rust control.....	1,679,357	- - -
Control and prevention of spread of gypsy moth.....	1,290,280	- - -
Peach mosaic control.....	199,306	- - -
Phony peach disease control.....	100,865	- - -
Citrus-canker eradication.....	44,569	- - -
General administrative expenses.....	115,871	- - -
Total, Emergency Relief Appropriation Act, 1937.....	7,649,200	- - -





Projects	Obligated, 1938	Estimated obligations, 1939
<u>Emergency Relief Appropriation Act, 1938:</u>		
Citrus canker eradication.....	- - -	\$ 41,063
Control of phony-peach disease.....	- - -	80,000
Control of peach mosaic disease.....	- - -	69,872
Control and prevention of spread of Gypsy moth.....	- - -	592,720
White-pine blister rust control.....	- - -	1,174,634
Eradication of Dutch elm disease.....	- - -	1,932,000
Barberry eradication.....	- - -	784,000
Locating and destroying Thurboria plants...	- - -	60,000
Construction of a plant and parasite re- ceiving station at Hoboken, N. J.....	- - -	400,000
Clearing building site at Hoboken, N. J....	- - -	40,000
General administrative expenses.....	- - -	175,000
Total, Emergency Relief Appropriation Act, 1938.....	- - -	5,349,289
<u>Payments for Agricultural Adjustment (in lieu of sugar tax funds):</u>		
Fruit-fly control in Hawaii.....	\$4,202	798
Insect pest survey in Puerto Rico.....	242	108
Total, Payments for Agricultural Ad- justment.....	4,444	906
<u>Special Research Fund, Department of Agri- culture:</u>		
Digestion by leaf eating insects.....	8,134	8,000
Effect of artificial control practices on natural enemies of insect pests....	13,325	16,500
Total, Special Research Fund.....	21,459	(a)24,500
Total, Emergency and Other Supplemental Funds (Direct Allotments).....	7,722,244	5,374,695

(a) Same amount estimated for 1940.



## PASSENGER-CARRYING VEHICLES

A decrease of \$4,505 (from \$46,880 in 1939 to \$42,375 in 1940) is submitted for the purchase of passenger-carrying vehicles. It is estimated that this amount will provide for the purchase of 70 cars, of which 68 will constitute replacements.

Of these turn-ins, 55 are of 1935 or earlier model and the average mileage of all machines to be turned in was in excess of 42,000 miles on August 1, 1938. Considerable more mileage will of course be added before the cars are actually exchanged.

In the case of the 2 cars on which there is to be no turn-in, the following explanation is offered:

One new machine is needed by the Division of Fruit Insects at Eugene, Oregon, where investigational work on insects attacking filbert nuts requires travel which cannot be performed to the best advantage by truck.

The other extra car is needed by the Division of Foreign Parasite Introduction. It is frequently necessary to transport living parasite material from the docks in New York to the Bureau's field station at Moorestown, N. J., and to other points. Trucks are barred from certain key highways in the New York area. In view of the greater protection which can be given parasite material in its movement by passenger-carrying vehicle and the greater speed possible (an important factor in parasite handling), the need for this machine is urgent.



## BUREAU OF BIOLOGICAL SURVEY

## (a) GENERAL ADMINISTRATIVE EXPENSES

Appropriation Act, 1939.....	\$110,000
Budget Estimate, 1940.....	118,000
Increase.....	<u>8,000</u>

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)	Increase
General administration and business service.....	\$109,613	\$110,000	\$118,000	+ \$8,000(1)
Unobligated balance.....	387	- - -	- - -	- - -
Total appropriation	110,000	110,000	118,000	+ 8,000

## INCREASE

(1) An increase of \$8,000 is recommended in this item to cover the additional costs incident to new accounting and property record procedure. The installation of new accounting procedure prescribed by the General Accounting Office and the revision of property accounting procedure have greatly increased the accounting work by requiring the maintenance of many new accounts, records, and controls not previously maintained. Other required changes in accounting procedure, such as the preparation by the Bureau's Accounting Section of daily summaries of disbursements by the various disbursing officers, have added greatly to the Bureau's work. Cost records of construction work, objective distribution of expenditures, and a more detailed distribution of expenditures by operating units are now accumulated by punch card and tabulating machine equipment. Additional funds are urgently needed to meet this situation.

## WORK UNDER THIS APPROPRIATION

This appropriation provides for the general administration, under the Chief and Associate Chief, of the research, control, regulatory, and service activities of the Bureau; and business administration, including fiscal and accounting matters, personnel, property, mail and files, and the coordination of divisional activities.





## (b) FOOD HABITS OF BIRDS AND ANIMALS

Appropriation Act, 1939.....\$68,140  
 Budget Estimate, 1940..... 68,140

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
1. Investigations of economic relationships of birds and other animals.....	\$47,379	\$47,573	\$47,573
2. Investigations of bird depredations and methods of control.....	14,515	14,658	14,658
3. Development of methods of improving and propagating food and cover for migratory bird and upland game areas.....	5,653	5,909	5,909
Unobligated balance.....	593	- - -	- - -
Total appropriation.....	68,140	68,140	68,140

## WORK UNDER THIS APPROPRIATION

General.--Work under this appropriation embraces the detailed study of the food habits of native wild birds and animals for the purpose of determining their relationship to agricultural and other interests. Species of birds, mammals, amphibians, and reptiles having beneficial food habits are made known, their protection and increase urged, and information as to methods of attracting and increasing their numbers published. Studies, essential to the satisfactory conduct of game-management projects, are made of the food habits of game species, methods of propagation, and the character of the environment for supporting the maximum numbers and the possibilities of its improvement. Methods of propagating preferred species of food and cover plants are studied and means of controlling undesirable and competing plants devised. When it is determined that species of birds or animals have destructive habits, studies are made to determine the extent and seriousness of the damage and methods of control or preventive measures are recommended. Extensive files on the economic relationships of foreign birds and animals are maintained as an aid in the determination of departmental policy with respect to the importation of foreign species.

Information on food habits, methods of attracting birds, propagation of game birds, propagation of food and cover plants, and related subjects is published in various popular and scientific articles and also made available to the public through circulars, leaflets, and bulletins.



1. Investigations of Economic Relationships of Birds and Other Animals.--During recent years there has been a rapidly growing public demand for information pertaining to wildlife. The work of this project is vital to a proper understanding of the economic status of various species of birds, mammals, and reptiles as they relate to agriculture, horticulture, and forestry. Through careful laboratory examination of the food contents of the stomachs of birds and other animals and through observations and investigations in the field, a composite picture is obtained of the food preferences and shelter requirements of the various kinds of game, fur animals, predators, and beneficial song and insectivorous birds. Such investigations and research into the food habits and cover requirements of the various wildlife species are a fundamental necessity both in appraising their economic status and in finding means of encouraging or discouraging their presence in a given area. On the basis of such research, means are devised for the improvement of natural food and cover conditions for beneficial species. These data form the basis for a determination of policies pertaining to the protection or control of the various wildlife species. The Migratory Bird Treaty Act, as well as other Federal and State legislation pertaining to the protection of bird life, are based on this information.

2. Investigations of Bird Depredations and Methods of Control.--Serious losses are caused by depredations of birds throughout the country, and investigations are necessary to determine the need for and extent of control, as well as to develop effective and selective methods for this purpose. This information is necessary to serve as a basis for the issuance of permits to destroy migratory game birds that are responsible for damage. Investigations often reveal simple and effective preventive methods that make extreme measures of control unnecessary. Scientific investigations establish with certainty the species of birds involved in reported depredations, and thereby the destruction of innocent species is frequently averted. In some sections it is virtually impossible to raise certain needed crops without some control or application of preventive measures. Research and experimentation are becoming increasingly necessary to control gregarious species, such as the European starling, that roost on buildings and trees in urban centers.

Under the terms of the Migratory Bird Treaty Act, responsibility for the control of protected migratory species is an obligation of the Federal Government. In the interest of wildlife, Federal guidance and cooperation with State and local Governments in directing control are urgently needed.

3. Development of Methods of Improving and Propagating Food and Cover for Migratory Bird and Upland Game Areas.--The development and maintenance of an adequate supply of food and cover are the first essentials of good wildlife management. Efforts to restore favorable conditions for game species and other forms of wildlife require detailed knowledge of methods of maintaining adequate food supplies at all seasons and the development of proper cover types to insure balanced habitats for every month of the year. This work involves fundamental research in planting and propagating desirable wildlife foods and studies to ascertain means of controlling undesirable or worthless plants which compete for dominance in wildlife habitats. Disease, climatic, and other factors frequently completely wipe



out food resources from important wildlife areas. Investigations to determine the best means of restoring food supplies in such areas are an important phase of the work conducted under this project.

Cooperation is maintained with State and other wildlife agencies engaged in managing wildlife areas. Results of experimental plantings of food and cover on numerous refuges and game preserves are compiled and utilized in furnishing regional data on wildlife food propagation.

### (c) FUR-RESOURCES INVESTIGATIONS

Appropriation Act, 1939.....\$91,000  
 Budget Estimate, 1940.....91,000

#### PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
1. Fur-animal restoration and production investigations...	\$10,544	\$20,786	\$20,786
2. Breeding, feeding, and management investigations in fur-animal production.....	18,300	16,060	16,060
3. Breeding, feeding, and management investigations in rabbit production.....	12,328	12,366	12,366
4. Investigations in developing fur resources of refuge areas.....	9,593	10,518	10,518
5. Investigations of diseases of fur animals.....	16,115	31,270	31,270
Unobligated balance.....	1,120	- - -	- - -
Transferred from "Maintenance of Mammal and Bird Reservations".....	-2,000	- - -	- - -
Total appropriation.....	66,000	91,000	91,000

#### WORK UNDER THIS APPROPRIATION

General.--The work under this appropriation consists of research in connection with the production, conservation, and utilization of fur animals, including rabbits for meat and fur, and the dissemination of this information through bulletins, periodicals, and leaflets to those conducting these enterprises. Methods employed in the management of fur farms and protected areas are investigated and studies are made of methods of breeding, feeding, and handling fur animals in captivity on farms. Research is conducted in the diseases of fur animals and rabbits to ascertain causes and develop





methods of treatment and prevention so as to minimize losses of these animals through disease. Fur-animal experiment stations are operated near Saratoga Springs, N. Y., and on the Blackwater Refuge, Md., and a rabbit experiment station is maintained at Fontana, Calif. From the results of studies conducted at these stations recommendations are made for the guidance of fur farmers and fur tradesmen.

1. Fur-Animal Restoration and Production Investigations.--The objects of this project are: (1) In view of the commercial importance of fur in industry, to emphasize the need of maintaining the supply of raw material; (2) to explain methods by which this supply may not only be maintained in quantity but improved in quality; and (3) to conduct research in the field, laboratory, and on experimental farms in the production of fur animals. Results are obtained by conducting complex and comprehensive experiments designed to determine fundamental principles of fur-animal production and fur utilization. The researches made include (a) foods and feeding; (b) genetics; (c) embryology; (d) fur technology; (e) economic problems in management and operation; (f) fur storage; and (g) statistics.

2. Breeding, Feeding, and Management Investigations in Fur-Animal Production.--This project deals chiefly with research in feeding, breeding, and handling fur animals in captivity. At the fur-animal experiment station near Saratoga Springs, N. Y., experiments are conducted with various species to determine the most satisfactory methods of raising fur animals in captivity; to ascertain conditions under which the various species can be raised profitably and produce good fur; to develop improved strains by selective breeding; and to learn the breeding, gestation, whelping, and prime-fur periods. The fur-animal experiment station is not operated as a farm for commercial profit through the sale of either breeding stock or pelts, but all energies are directed to developing economical methods of producing fur of fine quality. This is accomplished by conducting experiments in feeding, breeding, and management with the various species of fur animals. Observations are also made on fur farms in the United States and foreign countries. The surplus animals at the station are pelted, but the proceeds from the sale of skins are deposited in the United States Treasury and are not available for expanding the work of the station. No live animals are sold for any purpose.

3. Breeding, Feeding, and Management Investigations in Rabbit Production.--Work under this project consists of research to develop improved methods of breeding, feeding, housing, management, and judging rabbits for the purpose of assisting those engaged in the business to produce profitably meat and fur of fine quality; to produce rabbit meat so economically that it can be sold at a price that will be well within the means of the consumer; to improve the quality of fur so that it will be in demand by the fur trade; and to determine the relative value of rabbit manure in comparison with other manures.

Carefully planned experiments in the feeding and breeding of rabbits are conducted at the Rabbit Experiment Station at Fontana, Calif. At present the specific experiments have for their purpose the determination of the feasibility of using whole grains in rabbit feeding, the relative value of various protein supplements, adaptability of selective self feeder, possible



nutritional causes of so-called "bloat" responsible for enormous losses to rabbit producers, development of a superior strain of breeding rabbits, and various factors conducive to production of better skins adaptable to furriers' use. The experiments are progressive and so outlined as to render the most service toward solving the current problems of rabbit producers.

4. Investigations in Developing Fur Resources of Refuge Areas.--Work under this project consists of research on refuge areas in the natural habitat of fur animals to determine the breeding seasons, prime fur periods, food requirements, carrying capacity of areas, etc. Studies are made to determine the most efficient types of traps for taking various species of fur animals, the best methods of preparing pelts for market, and the most efficient system of marketing the fur. Recommendations are made for the guidance of refuge managers so that the income of the Federal Government from fur animals may be increased.

5. Investigations of Diseases of Fur Animals.--The work under this project consists of investigations of diseases of fur animals and rabbits. Fur producers are seriously hampered in the conduct of their operations by infectious diseases. Since most of these diseases are new and not fully understood in other animals, intensive research intended to reduce such losses is being conducted. Much of this research must necessarily be done in well-equipped laboratories. Facilities are being developed at the Patuxent Research Refuge, near Beltsville, Md., and at Pullman, Wash., in cooperation with the State College of Washington for research on diseases of fur animals in that region. A laboratory is also maintained in California for disease studies. Research is conducted in conjunction with cooperating institutions for the reduction of abnormal losses in fur animals so that the fur resources of the country will not be seriously depleted.



## (d) BIOLOGICAL INVESTIGATIONS

Appropriation Act, 1939.....	\$171,149
Budget Estimate, 1940.....	<u>186,000</u>
Increase.....	<u>14,851</u>

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)	Increase
1. Life-history, taxonomic, and distributional studies of wildlife.....	\$37,593	\$37,971	\$37,971	- - -
2. Game management surveys..	31,448	28,000	42,851	+ \$14,851(1)
3. Research in wildlife man- agement (cooperative).....	55,200	60,000	60,000	- - -
4. Investigations of wildlife resources of Alaska.....	12,528	12,690	12,690	- - -
5. Research in forest wild- life relationships.....	30,270	30,738	30,738	- - -
6. Investigations of diseases of wildlife (other than fur animals and birds)....	1,848	1,750	1,750	- - -
Unobligated balance.....	2,262	- - -	- - -	- - -
Total appropriation...	171,149	171,149	186,000	+ 14,851

## INCREASE

(1) This item provides for an increase of \$14,851 for the more effective operation of the Patuxent Research Refuge, Maryland. The Patuxent Research Refuge was established by Executive Order December 16, 1936, as a research center for all wildlife problems in the Middle Atlantic States. The refuge, which is comprised of approximately 3,000 acres of submarginal land, has been developed with emergency funds, and a laboratory and administration building, superintendent's house, and other dwellings, barns, pens for game birds and fur animals, fences, roads, dams, and ponds have been constructed. Funds are now required for personnel and general maintenance of the station. Intensive research dealing with the correlation of wildlife production with agriculture, forestry, and other land use is planned. Increased demands are constantly being made by the Forest Service, Soil Conservation Service, National Park Service, State game conservation commissions, farmers' organizations, and protective associations for information on the management and efficient handling of wildlife. Problems on which investigations are needed include the relationship of present wildlife resources to food and cover requirements, to forestry cutting practices, to farm cropping methods, and to types of farm crops. Studies are planned to determine the effect of wildlife on crop production and forest vegetative composition, to improve technique in game farming, and to compare artificially reared upland game birds with those produced naturally.





## CHANGES IN LANGUAGE

It is recommended that the final clauses of this paragraph be amended to read as follows:

"and for investigations [, experiments, and demonstrations in the establishment, improvement, and increase of the reindeer industry and of musk oxen and mountain sheep in] of the wildlife resources of the Territory of Alaska, including the erection of necessary buildings and other structures, \$\_\_\_\_\_."

This change in language is recommended in order to better describe the work now being conducted in Alaska under this appropriation.

## WORK UNDER THIS APPROPRIATION

General.--Field and laboratory investigations are made of the distribution, migration, classification, life history, and relations of wild animals and birds and of the natural life zones of the Continent. This work provides the sound basis of scientific facts required for use in the regulatory, economic, educational, and other work of the Bureau. It includes a special study of the relationships of wildlife to forest and grazing ranges, the preparation of game management programs, research studies on specific wildlife problems in the natural wildlife regions of the United States, and investigations of the wildlife resources of Alaska.

1. Life-History, Taxonomic, and Distributional Studies of Wildlife.--Investigations are conducted under this project for the purpose of procuring and publishing definite information concerning the classification, habits, distribution, and relationships of the birds and animals of the North American continent. A reference collection of birds, mammals, and other vertebrates is maintained as a basis for reports on their classification, life history and habits, distribution, and relationships. Field and laboratory investigations supply information which is constantly desired by institutions and individuals, as well as by Government departments, not only for proper determination and administration of wildlife policies, but also for use in studying the relations of wildlife to agriculture, stockraising, forestry, and public health.

2. Game Management Surveys.--Studies are made of big-game and fur-animals and game birds on definite areas as a basis for plans to increase the production of wildlife as a supplementary land crop. Information is obtained regarding present numbers of these species, their food and cover requirements, their feeding and breeding habits, and their relationship to other species and to their environment, to livestock grazing, and to other agricultural practices in the use of land to obtain maximum production for food, fur, and recreation. The object is the preparation of management programs that will make possible optimum production, sustained yield, and profitable use of these wildlife resources as an annual crop on Federally-owned lands and to determine principles of wildlife management that may be applied on State and private lands in the restoration and maintenance of a wildlife population sufficient to meet the increasing recreational and industrial



demand. Urgent requests for technical assistance in formulating management programs are received from all agencies of the Federal Government responsible for land administration and from State game commissions, conservation agencies, State planning boards, and farmers' organizations.

3. Cooperative Research in Wildlife Management.--The work conducted under this project is based on a plan for cooperative effort between the Biological Survey, the land-grant colleges, the State game or conservation departments, and the American Wildlife Institute in carrying on scientific research, practical demonstration, and educational work in wildlife problems in the principal natural wildlife regions of the United States. The leader of each unit is an employee of the Biological Survey who works in cooperation with these agencies. Ten units have been established to conduct such research and investigations as will furnish a scientific foundation upon which to base practical wildlife management practices.

Experimental and demonstration areas are maintained where game management practices are tested and demonstrated. Publications are prepared for use of persons desiring to cooperate in wildlife management, and lectures, radio talks, and demonstrations are given. The research program is conducted in such a manner that investigations undertaken, results obtained, and management practices recommended will gear into regular land use for agriculture, grazing, and forestry and will be practical. Cooperation is secured from such activities as forestry, farm economics, farm management, range management, and soils and crops.

4. Investigations of Wildlife Resources of Alaska.--The work undertaken under this project consists of studies of the game, fur animals, and other interesting and valuable species native to the Territory of Alaska, of restocking and management possibilities for valuable wildlife; of the food resources available for wildlife; and of the relationship of reindeer and other grazing animals to the welfare of the vastly important wildlife resources of the Territory. Management plans for guidance in administration are being developed based on the results of these investigations.

5. Research in Forest Wildlife Relationships.--Intensive work on the relation of wildlife to forested areas is being conducted in cooperation with the Forest Service at the research stations set up under this project in Minnesota, California, and Mississippi, and is well under way in newly established stations in Connecticut and Oregon. This work has been spread insofar as possible to the States surrounding these stations where the environmental factors are similar. Investigations are under way regarding the intricate relationships which exist between plants, animals, and birds and their relationship to domestic animals maintained on the areas. Such problems as the role of rodents and birds in forest reproduction, both by destruction of seeds and seedlings and as planting agencies, the range-carrying capacities for big-game animals such as deer and elk, and the competition that exists between various kinds of wildlife and domestic stock are being studied.

6. Investigations of Diseases of Wildlife (Other than Fur Animals and Birds).--Under this project investigations on diseases of wildlife, such



as rabbits, hares, big game, and other species, are conducted. This work is done largely in the field where outbreaks are reported, and the examinations of specimens and material are made in our pathological laboratories. Investigations are made to learn definitely the causes of specific ailments taking an important toll from valuable species in the field and where animals are maintained under controlled conditions. The objects of the project are to determine the exact cause and nature of the disease and to develop such methods of control as may be practically applied.

(e) CONTROL OF PREDATORY ANIMALS AND INJURIOUS RODENTS

Appropriation Act, 1939..... \$650,000  
 Budget Estimate, 1940..... 650,000

PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
1. Investigations of methods of control for predatory animals and injurious rodents.....	\$34,579	\$38,300	\$38,300
2. Control of injurious rodents.....	237,053	255,700	255,700
3. Control of predatory animals.....	337,390	356,000	356,000
Unobligated balance.....	2,978	- - -	- - -
Total appropriation	612,000	650,000	650,000

CHANGE IN LANGUAGE

Language has been inserted to provide reference in the appropriation item to the basic act of March 2, 1931 (7 U.S.C. 426-426b), authorizing this work.

WORK UNDER THIS APPROPRIATION

General.--Investigations and experiments are conducted to determine and demonstrate the best methods of bringing under control on national forests and other areas of the public domain, as well as on State, Territorial, and privately-owned lands, mountain lions, wolves, coyotes, bobcats, prairie dogs, gophers, ground squirrels, jack rabbits, and other animals injurious to agriculture, horticulture, forestry, animal husbandry, wild game animals, fur-bearing animals, and birds and for the protection of stock and other domestic animals through the suppression of disease carried by predatory or other wild animals. Campaigns for the control of such animals are carried on in cooperation with States, individuals, and public and private agencies, organizations, and institutions. Expenditures by these cooperating agencies in the fiscal year 1938 were approximately \$1,274,900.





Prairie dogs, ground squirrels, and other rodents cause great losses to farm crops and forage and serve as hosts for insects which may transmit sylvatic plague, tularemia, relapsing fever, and Rocky Mountain spotted fever to man throughout the western portion of the United States; and coyotes, mountain lions, wolves, and bobcats each year kill livestock, game, and poultry. Rats destroy foodstuffs and spread disease in the cities and rural sections of the entire United States, particularly the East and South. Field mice cause heavy losses in orchard sections of New England, the Atlantic seaboard, and the North Central States by girdling and destroying apple and other fruit trees.

1. Investigations of Methods of Control for Predatory Animals and Injurious Rodents.--Under this project important investigations are conducted to scientifically determine and improve methods of controlling predatory animals and injurious rodents. A laboratory is maintained at Denver, Colorado, and five field investigators are engaged on this work in different sections of the United States. Experiments and tests are conducted in the field and laboratory to develop methods of control that will be practical, economical, and efficient and at the same time result in a minimum of danger to harmless or valuable species of wildlife. Investigations of new and improved scientific methods of control constitute one of the most important parts of the field operations, and it is necessary that research keep pace with the changing conditions and requirements.

2. Control of Injurious Rodents.--Rodent-control work is conducted under cooperative agreements with States, counties, livestock and farm associations, and individuals. The depredations of rodent pests such as prairie dogs, jack rabbits, ground squirrels, pocket gophers, tree-girdling mice, and brown rats result in serious losses annually to forage and farm products and in many areas are the primary and contributing factors in serious soil erosion. The Biological Survey is being called upon to a greater extent each year to supervise extensive rodent-control operations on lands under the jurisdiction of the Forest Service, the Farm Security Administration, and the Soil Conservation Service, in the Department of Agriculture; the Indian Service, the Division of Grazing, and the Bureau of Reclamation, in the Interior Department; as well as on refuges administered by the Bureau of Biological Survey.

3. Control of Predatory Animals.--Under this project a program of work is carried on for the control of coyotes, bobcats, mountain lions, wolves, and other predators in areas where their depredations cause great loss to livestock, game, and poultry. The Federal Government has a distinct obligation in the control of predatory animals because of the fact that they breed and range largely on Federally-owned lands, including national forests, Indian reservations, and the public domain. Private ranchers are unable to provide funds to control these pests on the vast areas of public lands scattered throughout the West.

Wolf depredations to the reindeer herds and on mountain sheep and other game animals in Alaska have become so severe that the Bureau has found it necessary to lend some assistance. Through a cooperative arrangement with the Reindeer Service and the Indian Service of the Department of the Interior, the Civilian Conservation Corps, and the Forest Service, the Biological Survey is demonstrating to native trappers improved methods of taking wolves and coyotes.



## (f) PROTECTION OF MIGRATORY BIRDS

Appropriation Act, 1939.....	\$315,000
Budget Estimate, 1940.....	365,000
Increase.....	<u>50,000</u>

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)	Increase
1. Enforcement activities under the Migratory Bird Treaty Act...	\$234,814	\$235,000	\$285,000	+\$50,000(1)
2. Enforcement activities under the Lacey Act.....	28,568	29,000	29,000	
3. Investigations of the distribution, migration, and abundance of migratory game and other birds protected by the Migratory Bird Treaty Act...	50,718	51,000	51,000	
Unobligated balance.....	900	- - -	- - -	
Total appropriation.....	315,000	315,000	365,000	+ 50,000

## INCREASE

(1) An increase of \$50,000 is recommended in this item to strengthen the enforcement of the Migratory Bird Treaty Act. The Biological Survey is directly responsible for enforcement of the Migratory Bird Treaty Act making effective the treaties with Great Britain and Mexico with this object in view. In recent years many Federal refuges have been established in the United States where natural conditions are being restored for breeding migratory birds and providing feeding and resting areas. However, if the supply of birds is to be maintained, it is essential to preserve a sufficient number each year to return to the breeding grounds. The only manner in which this can be accomplished is by strict enforcement of the regulations limiting the annual take of birds. Although State game departments, game protective associations, and other organizations concerned with the protection of wildlife cooperate in this work, the responsibility for protecting migratory birds under the Migratory Bird Treaty Act and the regulations thereunder rests with the Bureau of Biological Survey. This obligation requires constant vigilance, with regular patrol on the part of an adequate number of field employees engaged in this work. With the present force of law-enforcement personnel, consisting of 41 United States Game Management Agents and 19 Deputy United States Game Management Agents, it is impossible to give the needed protection to migratory birds. At the present time the average district which each agent must patrol consists of about 80,000 square miles, and it is manifest that this large area can not be properly patrolled even with the assistance of the deputy agents. The recommended increase will provide for 6 additional agents and 6 deputies.



## WORK UNDER THIS APPROPRIATION

General.--The purpose of this appropriation is the enforcement of the Migratory Bird Treaty Act enacted by Congress July 3, 1918, to carry into effect the treaty with Great Britain for the protection of birds migrating between the United States and Canada, and the Act approved June 20, 1936, to carry into effect the convention between the United States and the United Mexican States (16 U.S.C. 703-711) for the protection of migratory birds and game mammals; the enforcement of the so-called Lacey Act, as amended by the Act of June 15, 1935 (18 U.S.C. 391-394); and the administration of Section 1 of the Act of May 25, 1900 (16 U.S.C. 701), relating to the introduction, distribution, preservation, and restoration of wild birds and the collection and publication of useful information as to their propagation, use, and preservation.

The enforcement of the Migratory Bird Treaty Act includes the determination of open and closed seasons for migratory game birds and the maintenance of a force of game-management agents throughout the country for the protection of migratory game and non-game species. Investigations are made of the abundance, migratory movements, and conditions which affect ducks, geese, and other migratory birds protected under the Migratory Bird Treaty Act.

The Act of March 4, 1909, as amended by Act of June 15, 1935, prohibits the importation into the United States of birds and mammals which may be injurious to agriculture or horticulture, provides for regulating the entry of other foreign wild mammals and birds into this country, and prohibits the transportation in interstate commerce of game and wild animals killed or shipped in violation of local laws.

1. Enforcement Activities under the Migratory Bird Treaty Act.--Under the Migratory Bird Treaty with Great Britain and the convention between the United States and Mexico the Department of Agriculture is charged with the enforcement of Federal laws protecting birds. Drainage projects, agricultural and commercial development, and drouth conditions have greatly diminished the breeding, resting, and feeding grounds of many species of migratory birds, particularly waterfowl. With the diminution in the number of acres of wild-bird habitat there has been a proportionate increased concentration of birds in the remaining areas, with the result that hunters have found it easier each year to locate large numbers of wild fowl for the purpose of hunting them. The necessity for more rigid enforcement of the Migratory Bird Treaty Act has increased accordingly.

Under the present system of Federal game-law enforcement the United States is divided into nine regions, and a Regional Director directs the activities of law-enforcement personnel within each region. The field force includes 41 U. S. game-management agents who enforce the Federal game laws in their respective districts throughout the United States. This force of officers is augmented by 19 U. S. deputy game-management agents. These deputy agents are divided into mobile squads of from two to four men and are assigned to duty where their services are most needed.







2. Enforcement Activities under the Lacey Act.--The Biological Survey is charged with the enforcement of the Lacey Act, as amended by the Act of June 15, 1935 (18 U.S.C. 391-394), to prohibit the importation of wild birds and mammals which may be injurious to agriculture or horticulture and to enforce the provision prohibiting the transportation in interstate commerce, by any means whatever, of game killed or shipped in violation of local laws. The suppression of illegal interstate shipments of wild animals or parts thereof is of inestimable benefit to the various States and is of great value in assisting in the maintenance of supplies of fur animals and game. The records of fur dealers, express companies, etc., are examined for the purpose of obtaining evidence of illegal shipments with a view to prosecution. If it were not for the vigilance of the Federal personnel engaged in this particular work, the maintenance of an adequate supply of beaver and other highly valuable fur animals would be greatly endangered. Inspection service maintained at principal ports of entry for the purpose of stopping the introduction into this country of injurious species of wild birds and mammals is vital to the welfare of the farmer and horticulturist.

3. Investigations of the Distribution, Migration, and Abundance of Migratory Game and Other Birds Protected by the Migratory Bird Treaty Act.--Investigation of the abundance, distribution, and migration of North American game and other birds for the purpose of determining accurately the limits of their breeding and wintering ranges, times of migration, flyways, and routes to and from breeding and wintering quarters, together with the changes in these ranges and routes that are brought about by natural causes or the works of man, are conducted under this project. The possession of such knowledge is vital to a sound regulatory policy concerning the game species.

Through the services of volunteer cooperators, aided and directed by the biologists on the staff of the Bureau, there is collected each year information relative to the various species of native birds. This is accomplished by special work in the field by Bureau employees, reports of observers, the work of about 2,000 banding stations scattered over the United States and Canada, and the compilation of material published in contemporary literature. Range maps are prepared from these data and reports are published on the different groups, while annual studies of the status of migratory waterfowl are the basis for the regulatory action of the Department governing the taking of these birds for food and sport.



## (S) ENFORCEMENT OF ALASKA GAME LAW

Appropriation Act, 1939..... \$130,798  
 Budget Estimate, 1940..... 130,798

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
Enforcement of Alaska Game Law.....	\$129,886	\$130,798	\$130,798
Unobligated balance.....	912	- - -	- - -
Total appropriation.....	130,798	130,798	130,798

## CHANGE IN LANGUAGE

The words "and by the Act of June 25, 1938 (52 Stat. 1169-1173)" have been inserted at the end of this paragraph to give reference in the appropriation item to the recent amendments to the Alaska Game Law.

## WORK UNDER THIS APPROPRIATION

The Alaska Game Law, approved January 13, 1925 (48 U.S.C. 192-211), was enacted to give greater protection to the wildlife resources of the Territory, including birds, game animals, and land fur animals, which constitute a national rather than a local concern. Under this Act was established the Alaska Game Commission of five members, one from each of the four judicial divisions, who are appointed by the Secretary of Agriculture for terms of four years; the fifth member of the Commission, who acts as executive officer, being the chief representative of the Bureau of Biological Survey resident in Alaska.

The Alaska Game Commissioners meet annually at Juneau. The great number of statements, petitions, and requests sent in by residents of the Territory are digested, and after these have been considered, together with the reports of the warden personnel, recommendations are made to the Secretary of Agriculture for necessary changes in the regulations for the protection of Territorial wildlife.

The problem of adequate law enforcement in Alaska has materially increased during the past two years, due in a large measure to the influx of nonresident trappers to the Territory. A total of 346 violations was reported during the fiscal year 1938 as compared with 329 in 1937 and 120 in 1936. At the present time there are 11 Wildlife Agents each of whom patrols an area in excess of 50,000 square miles.



Alaska is rich in wildlife resources and is one of the outstanding game regions of the world for wilderness game and fur animals, both of which contribute to the food and economic welfare of the residents, including the natives, who depend to a large extent upon these resources for their existence. Included among the game animals found in the Territory are moose, caribou, mountain sheep, mountain goat, Sitka deer, large brown and grizzly bear, and transplanted Olympic elk, American bison, and Greenland muskox. The large brown and grizzly bears of Alaska are the largest carnivorous animals in the world.

The land fur animals include beaver, muskrat, marmot, squirrel, fox, lynx, marten, mink, weasel, land otter, wolverine, polar bear, black bear--including its brown and blue (or glacier bear) color variations--wolves, coyotes, and hares. The annual cash return from fur produced in the Territory amounts to millions of dollars.

Most of the migratory game birds using the Pacific coast flyways come from the vast breeding and nesting areas of the Territory, and many species found breeding in Alaska are not known to breed elsewhere on the continent. Such unusual and valuable forms as the Emperor, cackling, white-fronted, Hutchins', and white-cheeked geese and black brant rear their broods in Alaska. Whistling swan and sandhill cranes nest commonly in the areas along the tundra behind the Bering and Arctic seacoast. Thousands of mallards, pintails, baldpates, green-winged teal, scaup, and other ducks leave Alaska each fall to furnish shooting for sportsmen of the States, their routes of migration and their early departure from the Territory resulting in only a figurative handful being killed by Alaskans. Vast numbers of the larger, more important shorebirds, such as curlews, godwits, golden and black-bellied plovers, yellowlegs, Wilson snipe, turnstones, dowitchers, and sandpipers find ideal nesting areas there. Three varieties of ptarmigan and five of grouse are native to Alaska and contribute largely to the food supply of the residents.

To these valuable wildlife resources of the Territory the Alaska Game Law furnishes Federal protection and at the same time gives the local residents a voice in the conservation and perpetuation of its wildlife through the Alaska Game Commissioners.

The gross receipts during the fiscal year 1938 from licenses, fines, and forfeitures were \$45,153.47. As provided by the Alaska Game Law, fifty percent of this sum was covered into the Treasury as "Miscellaneous Receipts" and fifty percent was turned over to the Territory for its school fund.





## (h) MAINTENANCE OF MAMMAL AND BIRD RESERVATIONS

Appropriation Act, 1939.....	\$447,500
Second Deficiency Act, 1938 (available in 1939 for refuge maintenance).....	60,000
Total appropriated, 1939.....	507,500
Budget Estimate, 1940.....	650,000
Increase.....	<u>142,500</u>

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)	Increase
1. Maintenance of mammal reservations.....	\$146,113	\$145,000	\$145,000	- - -
2. Maintenance of bird refuges..	250,060	(a) 309,000	451,500	+\$142,500(1)
3. Maintenance of Upper Mississippi River Wildlife Refuge....	34,821	35,500	35,500	- - -
4. Maintenance of Bear River Migratory Bird Refuge.....	16,127	18,000	18,000	- - -
Unobligated balance.....	879	- - -	- - -	- - -
Transferred to "Fur Resources Investigations".....	2,000	- - -	- - -	- - -
Total appropriation.....	450,000	(a) 507,500	650,000	+ 142,500

(a) Includes \$300 transferred to Bureau of Standards, Department of Commerce, for photographic research.

## INCREASE

(1) An increase of \$142,500 is needed for the maintenance of bird refuges now under partial administration and refuges previously maintained from emergency funds. Special funds for the purchase, development, and maintenance of refuges are no longer available. Development work has been completed by the CCC and WPA organizations on a number of refuges, but the cost of maintenance must be met from regular funds; personnel and equipment should be provided to insure necessary fire protection and adequate patrol maintained against vandalism and trespass. Some of the areas have valuable forest stands and other plant life, as well as numerous buildings, fences, recreational equipment, and water-control structures, which must be protected and maintained. Other refuges now under the simplest custodial administration must be placed under full administration to keep the areas serviceable for the wildlife population and in a condition to produce the maximum amount of wildlife. Funds are needed for the employment of refuge managers and patrolmen and to acquire and maintain road, dyke, farm, and fire equipment, as well as for operating expenses and the upkeep of improvements. The returns to the Government are increasing yearly from many refuges through the disposal of surplus products such as hay, grazing, timber, and furs.



In the four years which have elapsed since the great expansion of the refuge system its practical effect in conserving the waterfowl, as well as in greatly increasing native game birds and fur resources, has been most encouraging. It is now evident that, with the maintenance of a complete refuge system, which is indispensable for the protection of these valuable species, and with necessary restrictions on the take, our important migratory game birds and other migratory species can be maintained.

#### WORK UNDER THIS APPROPRIATION

General.--Work under this appropriation consists of the administration of wildlife refuges which were selected for their suitability for forms of wildlife that had become greatly reduced in numbers or where notable colonies of birds or mammals requiring protection existed. On four big-game preserves herds of buffalo, elk, and other big-game animals are maintained under fence. The administration of the Upper Mississippi River Wildlife Refuge, the Bear River Migratory Bird Refuge, and other bird refuges is carried on under this appropriation. The administration and maintenance of these refuges include patrolling and posting; construction of improvements, such as buildings, fences, lookout towers, dikes, dams, and reservoirs for water conservation, watering places for animals, roads and trails, etc.; repair of such improvements; raising hay and feeding big-game animals; propagation of aquatic food plants and raising grain for waterfowl; reforestation and fire prevention and control; removal of surplus animals from the big-game preserves; and restocking of areas through the transfer of game animals from other points. The sum of \$60,350.39 was deposited in the U. S. Treasury during the fiscal year 1938 as the result of sale of surplus products from all wildlife refuges. As provided by law, 25 percent of this sum has been paid to the counties in which the refuges producing the products are located.

1. Maintenance of Mammal Reservations.--Big-game refuges are maintained for the perpetuation of valuable species of wildlife which were facing extinction prior to the establishment of preserves for their protection, such as buffalo, elk, antelope, desert bighorns, and other species. Herds of buffalo and elk, and in some instances other species, are maintained in fenced pastures on the Bison Range, Sullys Hill, Niobrara, and Wichita Refuges. The Elk Refuge is maintained for the production of forage for large numbers of elk in the southern Yellowstone herd that winter in the Jackson Hole region. The Hart Mountain and the Charles Sheldon Antelope Refuges include the summer and winter ranges of some 4,000 antelope and large numbers of mule deer and sage grouse. The Desert Game Range is an important area for the protection of Nelson Rocky Mountain Sheep. The Munivak Island Game Range in Alaska is the home of muskoxen, caribou (a cross between caribou and reindeer), and reindeer. The Little Pend Oreille Refuge was selected for the preservation of the Rocky Mountain or Pend Oreille white-tailed deer, probably the largest of all North American white-tailed deer.

In the administration of the refuges range management is practiced for the protection and production of forage under the best plans that can be devised for the particular areas, while at the Elk Refuge extensive farming



operations are conducted. The areas are protected from trespass and many other forms of wildlife in addition to the primary species are given protection.

Big-game Animals on Fenced Preserves Administered

by the Biological Survey (as of June 30, 1938).

	<u>Buffalo</u>	<u>Elk</u>	<u>Mountain</u> <u>Sheep</u>	<u>White-tailed</u> <u>Deer</u>	<u>Mule</u> <u>Deer</u>	<u>Antelope</u>	<u>Total</u>
Bison Range, Mont..	340	*22	48	*23	*109	-	542
Fort Niobrara, Nebr.	134	*27	-	7	* 5	-	173
Sullys Hill, N. Dak..	22	*33	-	12	-	-	67
Wichita Mts., Okla..	545	*204	-	*773	-	15	1337
Total.....	841	*286	48	*815	*114	15	2119

\*Estimated.

In addition to the big-game animals, there are 132 longhorn cattle on the Wichita Mountains Wildlife Refuge, Okla., and 14 of these animals on the Fort Niobrara Game Preserve, Nebraska.

2. Maintenance of Bird Refuges.--Work under this project consists of rehabilitating, developing, and administering areas that have been set aside primarily for migratory waterfowl and other birds.

Among the more important refuges administered or to be administered under this project are the White River Refuge, Arkansas, protecting one of the greatest winter concentration areas of mallards in the United States; Red Rock Lakes Refuge, Montana, an excellent duck-nesting area and one of the few remaining nesting places of the trumpeter swan; Lake Mattamuskeet Refuge, North Carolina, the most important goose and swan wintering area on the Atlantic coast; the Upper and Lower Souris Refuges, North Dakota, the greatest nesting restoration to date; the Lake Malheur-Blitzen Valley Refuge, Oregon, a restoration of the greatest waterfowl area in the Pacific coast region; Aransas Refuge, Texas, the resort each winter of many whooping cranes, a species nearing extinction; Ruby Lake Refuge, Nevada, one of the most serviceable nesting areas for ducks and geese; and the Kentucky Woodlands Refuge, Kentucky, an important refuge for the protection of waterfowl.

To the extent that emergency funds have permitted an extensive development program has been initiated and in some cases completed, involving further impoundment of water, erection of nesting islands, food plantings, reforestation, reduction and control of fire hazards, building of patrol roads and lanes, erection of patrol towers and stock-proof fencing, water-table investigations, sinking of artesian wells, flood irrigation, and many other rehabilitation activities.

5. Maintenance of Upper Mississippi River Wildlife Refuge.--This refuge was established by the Act of Congress approved June 7, 1924 (16 U.S.C. 721-731), authorizing an appropriation of \$1,500,000 for the acquisition of lands in the overflow area of the Mississippi River in the States of





Illinois, Iowa, Minnesota, and Wisconsin between Rock Island, Illinois, and Wabasha, Minnesota, a distance of approximately 300 miles. Approximately 147,300 acres have been acquired for refuge purposes. The administration of this project includes the supervision and patrol of the area to protect its abundant wildlife; to prevent and suppress forest fires; to regulate and supervise under a permit system as much recreational use of the area as is compatible with the needs of the wildlife; to supervise public shooting grounds; to propagate, disseminate, and preserve aquatic plants which are important in the production of waterfowl food; to raise large quantities of small grains as supplementary foods for the early spring concentrations of waterfowl in this area, which occur in literally hundreds of thousands; to take over and develop the lands acquired by the Government in connection with the Army Engineers Corps' development of a nine-foot channel in the Mississippi; to assist State conservation officers in the enforcement on the area of State conservation laws; and to supervise the sale of excess products.

4. Maintenance of Bear River Migratory Bird Refuge.--The establishment of this refuge, which includes marsh and water areas totaling 57,283 acres, was authorized by the Act of April 23, 1928 (16 U.S.C. 690-690h) to eliminate the danger to wild fowl from botulism, which in certain years of drought or unfavorable conditions had resulted in the death of from 150,000 to 250,000 waterfowl in the marshes bordering Great Salt Lake, Utah. To remove the potential death trap and to greatly enhance and increase the carrying capacity of this area for waterfowl, an intricate, massive dike system was provided for the maintenance of approximately 28,000 acres of fresh water, divided into five units. Forty percent of this flooded area was allowed to be used as public shooting grounds by the Act of Congress establishing the refuge. The remainder is administered as an inviolate sanctuary. The Bear River Migratory Bird Refuge is one of the most important refuges from the standpoint of breeding migratory waterfowl and is a key feeding, nesting, and restoration concentration point for the waterfowl in the Pacific flyway.

The administration of the refuge includes the maintenance and surfacing of the dikes by riprap to prevent damage by wave action; the careful operation of control gates to provide the proper water levels for food production, nesting safety, and the release of flood waters; construction of patrol roads and trails; propagation and dissemination of duck-food plants; reduction of predators in the interest of increased nesting; patrol of the area against trespass and violation of refuge and migratory bird laws; supervision of the public shooting grounds; and, within recent years, provision of study facilities for the large numbers of wildlife students, nature lovers, and members of outdoor and sportsmen's organizations who frequent this great wildlife area. The refuge is also used as a research station for field and laboratory studies of migratory waterfowl.



## (i) MIGRATORY BIRD CONSERVATION REFUGES

Appropriation Act, 1939.....\$79,753  
 Budget Estimate, 1940..... 79,753

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
1. Administration of migratory bird conservation refuges.....	\$22,659	\$22,700	\$22,700
2. Investigations of native game birds and refuge ecology.....	5,862	5,968	5,968
3. Investigations of diseases of birds.....	14,614	14,900	14,900
4. Examinations, surveys, and acquisition of refuge land.....	34,908	36,185	36,185
Unobligated balance.....	1,710	- - -	- - -
Total appropriation.....	79,753	79,753	79,753

## WORK UNDER THIS APPROPRIATION

General.--The Migratory Bird Conservation Act of February 18, 1929 (16 U.S.C. 715-715r), authorized a 10-year program for the establishment of a national system of refuges for the conservation and perpetuation of waterfowl and other migratory birds. Work under this appropriation includes the maintenance and administration of refuge areas acquired under this Act and the development of such areas and other refuges; the elimination of loss of migratory birds due to botulism, oil pollution, disease, or other causes; biological investigations of waterfowl and upland game birds; and examinations, surveys, and acquisition of land and water for migratory-bird refuges throughout the United States.

1. Administration of Migratory Bird Conservation Refuges.--Refuges acquired or established under the Migratory Bird Conservation Act are partly administered under this project. Full-time refuge managers are provided at the Cape Romain Refuge, South Carolina; St. Marks Refuge, Florida; and Crescent Lake Refuge, Nebraska, which were established as breeding, resting, and feeding areas for migratory waterfowl and other birds. Extensive developments and improvements have been made on the refuges under Public Works funds and with the aid of C. C. C. camps.

2. Investigations of Native Game Birds and Refuge Ecology.--The object of this project is to determine practical correlations in refuge land use between waterfowl and upland game species; to gain information on the life history and habits of the various species, particularly as such factors relate



to reproduction and maintenance of waterfowl and other native game birds; to improve methods for production and management on refuges and other areas of important native upland game birds; and to improve management of refuges and other areas as breeding and wintering grounds for waterfowl. Field and laboratory investigations are conducted upon various species of waterfowl and other native game birds to learn their life habits, environmental requirements, and interrelationships, and to determine their adaptability to refuges and other areas.

3. Investigations of Diseases of Birds.--Under this project work is conducted on diseases attacking migratory waterfowl and upland game birds. The excessive losses from such conditions as botulism, lead poisoning, and parasitism demand continued research on waterfowl diseases. Investigations on botulism are to be continued to find, if possible, some means of reducing losses where a control of the water level is not feasible.

4. Examinations, Surveys, and Acquisition of Refuge Land.--Potential refuge areas are examined to determine those best adapted biologically for such purposes. Favorable reports are followed by investigations to determine the types of land and their extent, the soil cover, improvements, etc., and to ascertain the market value of those tracts under consideration for purchase. Negotiations with the owners are conducted to reach equitable price agreements and options are secured. Refuges can not be acquired in any State until the State has passed enabling legislation consenting to the acquisition of land by the Federal Government. No purchase can be made of an area until it has been approved by the Migratory Bird Conservation Commission. Under the Migratory Bird Conservation Act more than 4,000,000 acres in 141 proposed refuge sites have been examined and ownership records compiled. For the past several years the appropriations have been inadequate to permit any purchases under this appropriation, but examinations, appraisals, surveys, and topographic studies and map-making have been carried on by the small force retained under this project.

(j) IN ALL, SALARIES AND EXPENSES

Change in Language

It is recommended that the language of this paragraph be amended by inserting after the words "In all, salaries and expenses," the following:

"to be accounted for as one fund"

For explanation of this change see general note in these Justifications under Office of Experiment Stations, page 54.





## (k) UPPER MISSISSIPPI RIVER WILDLIFE REFUGE

Appropriation Act, 1939.....	- - -
Budget Estimate, 1940.....	\$60,000
Increase.....	<u>60,000</u>

## PROJECT STATEMENT

Project	1938	1939 (Estimated)	1940 (Estimated)	Increase
Acquisition of land, Upper Mississippi River Wild- life Refuge.....	- - -	- - -	\$60,000	+\$60,000 (1)

## INCREASE

(1) This new item proposes an expenditure of \$60,000 for the acquisition of land for the Upper Mississippi River Wildlife Refuge. Pursuant to the development of a nine-foot channel in the upper reaches of the Mississippi River, the War Department is engaged in the construction of locks and dams within the area previously established for the Upper Mississippi Refuge. This development work has resulted in changing the physical conditions of the lands within the pool areas created by dam construction. As new structures are erected, lands which previously were overflowed only at high water stages have been and are becoming permanently flooded. As a result of the expansion of the water areas, it will ultimately be necessary, in order to effectively administer the lands previously acquired for inclusion in this refuge, to purchase some additional lands bordering the pools created and planned. An appropriation is needed for the fiscal year 1940 for the acquisition of fee title to part of the land on which flowage easements only have been purchased by the War Department. These lands are intermingled with the refuge lands, and it is essential that their full control be vested in the Government so as to prevent hunting or other undesirable use of the land by the owners which would be incompatible with the refuge concept.

## WORK UNDER THIS APPROPRIATION

This activity was initiated by special Act of Congress approved June 7, 1924, which authorized a total appropriation of \$1,500,000 for the acquisition of lands in the overflow area of the Mississippi River in Illinois, Iowa, Minnesota, and Wisconsin between Rock Island, Ill., and Wabasha, Minn.--a distance of approximately 300 miles--for the purpose of establishing a refuge for wild animals and birds and for the conservation of wild flowers and aquatic plants (under the Department of Agriculture) and as a refuge and breeding place for fish and other aquatic life (under the Department of Commerce). A total of \$910,838 has been appropriated to date. Land acquisition has proceeded as rapidly as possible under the price limitations of the



Act and available appropriations. The work incident thereto includes the examination and valuation of lands, negotiations with tract owners for the purpose of arriving at satisfactory agreements, examinations of titles, and boundary surveys of lands being acquired. At the close of the fiscal year 1938 a total of approximately 147,300 acres had been acquired for refuge purposes.

# (1) MIGRATORY BIRD CONSERVATION FUND

Appropriation Act, 1938.....\$750,000(a)  
 Budget Estimate, 1940..... 750,000(a)

(a) The above amounts are the estimated receipts from the sale of Federal hunting stamps for the fiscal years involved; of which the Agricultural Appropriation Act for 1938 and the estimates for 1940 provide for an advance of \$125,000 from the Treasury pending deposit of hunting-stamp receipts. This advance is repaid to the Treasury from the first \$125,000 deposited in the fund. The unobligated balance from stamp sales in prior fiscal years and the receipts for the current fiscal year are also available for expenditure.

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
1. Administration and enforcement of Migratory Waterfowl Hunting Stamp and Migratory Bird Treaty Acts.....	(a)\$70,893	(a) \$75,875	(a) \$75,000
2. Acquisition, development, and maintenance of migratory bird refuges.....	365,959	1,225,488	675,000
Total obligations.....	436,852	1,301,363	750,000
Plus unobligated balance held as a reserve for succeeding fiscal year.....	+851,363	+300,000	+300,000
Less unobligated balance brought forward from prior fiscal year.	-517,244	-851,363	-500,000
Total deposited.....	770,971	750,000	750,000

(a) Includes \$20,000 transferred to the Post Office Department for expenses incurred in the issuance and sale of stamps.



## CHANGES IN LANGUAGE

Necessary changes in fiscal years have been recommended to make the appropriation applicable to the fiscal year 1940. The code citations have also been corrected.

## WORK UNDER THIS APPROPRIATION

General.--The Migratory Waterfowl Hunting Stamp Act of March 16, 1934 (16 U.S.C. 718-718h), as amended by Act of June 15, 1935 (16 U.S.C., 718a-718e), provides that every hunter of migratory waterfowl must have in his possession a Federal hunting stamp. The stamps are sold at post offices at a cost of one dollar each. The funds provided by the sale of these stamps are used for wildlife conservation, being expended on the basis of 90 percent for acquiring, restoring, and administering potential waterfowl habitats as inviolate refuges, and 10 percent for the enforcement of the various Acts for the protection of migratory birds and the expenses of the Post Office Department for engraving, issuing, and accounting for the stamps.

This Act was passed because of the rapid diminution in the numbers of migratory waterfowl and especially because of the appalling reduction of these birds during the protracted drought period which existed in the heart of the migratory-waterfowl breeding grounds in the interval between the summers of 1930 and 1935. During those years the migratory flocks became so reduced in numbers that sportsmen and conservationists alike were alarmed at the apparent extinction facing this valuable recreational and economic resource. This concern for migratory wildlife spread to all walks of American life, and, when the numbers of the birds continued to diminish, public opinion and demand became so mobilized that Congress enacted the Migratory Bird Hunting Stamp Act to provide funds for the conservation of migratory waterfowl as a definite and recognizedly important section of our national wildlife resources.

The amount covered into this appropriation as receipts from the sale of hunting stamps for the period July 1, 1937, to June 30, 1938, was \$770,971.

1. Administration and Enforcement of Migratory Waterfowl Hunting Stamp and Migratory Bird Treaty Acts.--The expenditure of ten percent of the receipts from sales of migratory waterfowl hunting stamps is authorized for the administration and enforcement of the Migratory Waterfowl Hunting Stamp and Migratory Bird Treaty Acts, including expenditures incurred by the Post Office Department for issuance and sale of stamps. A vigorous enforcement campaign in all the States to see that this revenue-producing statute is obeyed is of prime importance. The field law-enforcement officers employed under this project work in cooperation with those employed under the Migratory Bird Treaty Act to enforce all Federal laws and regulations protecting migratory birds.

2. Acquisition, Development, and Maintenance of Migratory Bird Refuges.--The development and maintenance of refuge areas with the proper biological conditions necessary for the survival of migratory waterfowl is one of the most important duties performed by the Biological Survey. As it





is necessary at the present time to use a large portion of the Migratory Bird Conservation Fund for development and maintenance purposes, acquisition of additional areas under this appropriation is being subordinated to restoration, development, maintenance, and patrol activities. The Biological Survey is faced with the task of restoring areas ruined for wildlife by unprofitable drainage ventures, which reduced former excellent waterfowl and other wildlife habitats to a condition of wildlife barrenness. This calls for a high degree of scientific development and maintenance, inasmuch as each acre of live marsh must now be made to afford sanctuary facilities for more than the former natural carrying capacity.

Work under this project includes reconnaissance and habitat improvement, restoration and development, and maintenance and patrol.

Habitat improvement consists of the biological rehabilitation of areas which must be worked over and made acceptable to waterfowl by planting of the proper food and cover plants, trees, and other vegetation; control of waterfowl disease epidemics; manipulation of water levels in the most advantageous way; reforestation and erosion control; creation of nesting islands; range management; and other developments conducive to the wildlife production of the area. The personnel engaged in this work consists of trained waterfowl biologists who make exploratory surveys along the main flyways of migratory waterfowl and select areas for acquisition and development which show the best potentialities for wildlife and waterfowl sanctuary purposes.

Restoration and development activities consist of hydraulic engineering and architectural developments on the refuges. There are very few natural waterfowl habitats of any great size left. It is therefore necessary to restore former natural areas which have been unsuccessfully drained or otherwise have had their original suitability for waterfowl changed. Almost every area requires extensive impounding and stabilization of water levels to secure a safe and permanent water supply. After hydraulic and topographic surveys have been made, engineering contracts are let to provide for necessary water impoundment.

Maintenance and patrol work involves the administration and protection of refuges, which, due to the limited funds available, can not be administered under the appropriation "Maintenance of Mammal and Bird Reservations". This work consists of removal of fire hazards; laying-out and maintenance of fire lines; posting refuges against trespass; patrolling areas to enforce the migratory bird refuge laws; reduction of predators; supervising the sale of excess products from the refuges such as hay, timber, forage, etc.; raising considerable amounts of small grains as a supplement to the natural waterfowl foods occurring on the refuge; repairing water impoundment stabilization systems and maintaining water levels; supervising recreation centers; and performing other administrative duties necessary for the maintenance of refuges at the highest possible level of productivity and serviceability to migratory birds.



## (m) FEDERAL AID TO STATES IN WILDLIFE RESTORATION PROJECTS

Appropriation, 1939.....\$1,000,000  
 Budget Estimate, 1940..... 1,000,000

## PROJECT STATEMENT

Projects	1939 (Estimated)	1940 (Estimated)	Increase or Decrease
1. Administration of Federal aid to States for wildlife-restoration projects.....	\$110,000(a)	\$140,000	+ \$30,000
2. Federal aid payments to States for wildlife restoration projects.....	890,000	860,000	- 30,000
Total.....	1,000,000	1,000,000	- - -

(a) Includes \$1,300 transferred to "Rent of Buildings, Department of Agriculture."

No change in the amount of this item is estimated for 1940. The adjustment of funds indicated between projects is necessary to provide sufficient funds for administrative purposes for the fiscal year 1940. Since many positions established in connection with the administration of the Act were not filled until the current fiscal year was partially completed, \$30,000 less has been required for personnel expenditures for the fiscal year 1939 than will be necessary for 1940.

## WORK UNDER THIS APPROPRIATION

The Federal Aid to States in Wildlife-Restoration Act of September 2, 1937 (16 U.S.C. 669-669j), authorizes the Secretary of Agriculture to cooperate with the respective State fish and game departments on wildlife-restoration projects, and for carrying out the purposes of the Act authorizes the appropriation of an amount equal to the revenue accruing during the fiscal year ending June 30, 1939, and for each fiscal year thereafter, from the tax imposed by Section 610, Title IV, of the Revenue Act of 1932 (47 Stat. 169), as heretofore or hereafter extended and amended, on firearms, shells, and cartridges. The Secretary is authorized to apportion not less than 92 percent of the fund accruing under the Act to the respective States on the basis of one-half in the ratio which the area of the State bears to the total area of all the States and one-half in the ratio which the number of paid hunting-license holders of each State in the preceding fiscal year bears to the total number of paid hunting-license holders of all the States, with the further limitations that the apportionment for any one State shall not exceed the sum of \$150,000 annually, but, where the apportionment to any State under the Act is less than \$15,000 annually, the Secretary may allocate not more than \$15,000 of the fund to said State if it sets aside not less than \$5,000 from its own fish and game fund or makes an appropriation of this amount for the purposes of the Act.



So much, not to exceed eight per centum, of the proceeds from the tax as the Secretary of Agriculture may estimate to be necessary is authorized to be made available for his expenses in the administration and execution of this Act and the Migratory Bird Conservation Act.

The wildlife resources of the States and the Nation are highly valuable assets and their conservation and perpetuation have been matters of deep concern not only to those who are interested in the annual sport and recreation of hunting game species but also to the great host of our national population who enjoy wild creatures from an aesthetic point of view, as well as to farmers, horticulturists, and others who are economically benefited through the food habits of birds and other wildlife in the destruction of rodents, insects, and noxious weed seeds. Wildlife resources of the Nation also supply the basis for an extensive commercial business of supplying recreational needs and equipment.

This legislation will be most effective in correlating the Federal and State agencies in a unified attack on the problems of wildlife conservation on a nationwide scale.

1. Administration of Federal Aid to States for Wildlife Restoration Projects.---Section 4 of the Act of September 2, 1937, for Federal aid to States in wildlife restoration authorizes the use of not to exceed eight percentum of the funds accruing thereunder as may be estimated by the Secretary of Agriculture to be necessary for his expenses in the administration and execution of the Act and the Migratory Bird Conservation Act. Provision must be made for the examination of the plans of the States, the inspection of the areas to be developed, the examination and appraisal of lands where land purchases are involved, an engineering study of proposed development work to determine its adequacy, feasibility, and reasonableness in cost, approval of plans, and the apportionment of funds. It is also necessary to inspect the progress of the work to determine whether or not the project has been completed in accordance with the standards and regulations of the Department of Agriculture and with the approved plans for the project.

2. Federal Aid Payments to States for Wildlife-Restoration Projects.---This project covers the apportionments by the Secretary of Agriculture to the various States under the provisions of the Act of September 2, 1937, to provide that the United States shall aid the States in wildlife-restoration projects. After the apportionment of the funds accruing under the Act, in accordance with its provisions, to the respective States and the certification thereof to the Secretary of the Treasury and to the various State Fish and Game Departments, it is necessary for the Secretary to obtain full and detailed statements from the respective State authorities of the wildlife-restoration projects proposed in each State, and upon determining after investigation that such projects meet the standards set up by him and approving the projects, it is necessary to obtain from the State such surveys, plans, specifications, and estimates as are necessary to the execution of such approved projects. Upon approval of the plans, specifications, and estimates for the project, the Secretary notifies the State Fish and Game Department and certifies the fact to the Secretary of the Treasury, who thereupon must set aside so much of said fund as represents





the share of the United States payable under this Act on account of such project. This sum is limited to not to exceed 75 percent of the total estimated cost of such project. Expenditures for engineering, inspection, and unforeseen contingencies on works to be constructed under the Act may not exceed 10 percent of the estimated cost of the project and are required to be met by the State as a part of its total contribution to the cost of such works. It is necessary for the Secretary to supervise all construction and research projects conducted under the provisions of this Act in order thereby to certify payments on the respective projects as they progress or are completed. The apportionments of Federal funds by states for the fiscal year 1939, together with State contributions, are as follows:



Apportionment of Funds to States for use in Federal Aid in Wildlife Restoration Projects for the Fiscal Year ending June 30, 1939  
pursuant to Section 5 of Act approved September 2, 1937 (50 Stat. 917). This apportionment supersedes  
the tentative apportionment made by the Acting Secretary of Agriculture July 22, 1938.

States	Area in Acres	Apportionment on Basis of Area	Paid License Holders F.Y. 1938	Apportionment on Basis of License Holders	Total Federal Apportionment	State Contribution	Grand Total for Projects
Alabama	33,278,720	\$ 7,044.95	88,786	\$ 5,767.76	13,412.71	4,470.90	17,883.61
Arizona	72,931,840	16,754.25	28,592	1,857.41	18,611.66	6,203.89	24,815.55
Arkansas	34,134,400	7,841.52	36,419	2,365.87	10,207.39	3,402.46	13,609.85
California	101,310,080	23,273.44	110,151	7,155.69	22,438.53	12,422.88	49,691.52
Colorado	66,526,720	15,282.84	27,235	1,769.25	2,499.22	7,479.51	29,918.04
Connecticut	3,177,600	729.97	15,656	1,017.05	1,365.50	833.07	3,332.29
Delaware	37,546,240	8,625.30	55,635	3,614.19	12,239.49	4,079.83	16,319.32
Florida	37,929,600	8,713.37	66,220	5,301.82	13,015.19	4,318.40	17,333.59
Georgia	33,688,320	8,331.11	84,775	5,507.20	17,840.74	5,946.91	23,787.65
Idaho	36,265,600	5,344.91	274,139	17,898.76	26,139.87	8,713.29	34,853.16
Illinois	23,266,560	5,344.91	428,937	27,864.83	33,209.74	11,069.91	44,279.65
Indiana	35,934,080	8,254.95	132,447	8,604.09	16,859.04	5,619.68	22,478.72
Iowa	52,581,120	12,079.19	74,358	4,830.48	16,909.67	5,636.56	22,546.23
Kansas	25,982,720	5,968.87	95,239	6,186.97	12,155.84	4,051.95	16,207.79
Kentucky	31,043,840	7,131.54	73,487	4,773.90	11,905.44	3,968.48	15,873.92
Louisiana	21,145,600	4,857.67	73,487	6,173.32	11,030.99	3,677.00	14,707.99
Maine	5,290,240	1,215.30	61,247	4,108.68	5,921.04	1,944.75	7,865.72
Maryland	37,107,200	8,524.45	71,102	4,618.96	5,834.26	1,944.75	7,779.01
Massachusetts	54,136,480	12,450.28	648,966	42,158.46	50,682.91	16,894.30	67,577.21
Michigan	29,993,500	6,890.27	105,974	13,901.78	26,352.06	8,784.02	35,136.08
Minnesota	49,078,080	11,397.29	177,896	6,884.34	13,774.61	4,591.54	18,366.15
Mississippi	49,612,800	10,206.40	194,583	10,442.10	20,248.50	6,749.50	26,998.00
Missouri	70,841,600	16,274.07	77,896	5,060.32	26,672.39	8,890.80	35,563.19
Montana	5,978,240	1,373.35	8,448	9,031.22	20,428.51	6,809.50	27,238.01
Nebraska	5,263,360	1,209.12	50,210	548.80	16,822.87	5,607.62	22,430.49
Nevada	78,485,760	18,030.13	126,388	3,261.77	4,635.12	1,545.04	6,180.16
New Hampshire	31,490,560	7,234.16	24,313	8,210.48	9,419.60	3,139.87	12,559.47
New Jersey	33,592,640	7,707.88	649,973	1,579.43	19,603.56	6,536.52	26,146.08
New Mexico	45,335,680	10,414.73	16,570	42,223.88	49,458.04	16,486.01	65,944.05
North Carolina	26,265,600	6,033.56	507,732	32,983.55	39,017.41	13,005.80	52,023.21
North Dakota	44,807,680	10,893.44	85,578	5,559.36	15,852.80	5,284.27	21,137.07
Ohio	61,887,360	14,217.06	77,478	5,033.17	19,250.23	6,416.74	25,666.97
Oklahoma	28,880,640	6,534.60	666,371	39,391.39	46,025.99	15,342.00	61,367.99
Oregon	19,832,960	4,556.12	798,720	545.56	729.05	243.02	972.07
Pennsylvania	26,894,080	6,178.26	86,416	5,613.80	10,169.92	3,389.97	13,559.89
Rhode Island	170,202,240	39,099.68	69,381	2,031.31	13,442.57	4,480.86	17,923.43
South Carolina	46,673,600	11,411.26	31,269	4,507.16	10,685.40	3,561.80	14,247.20
South Dakota	54,393,600	12,495.56	109,895	7,139.06	15,866.34	15,412.91	61,651.65
Texas	6,120,960	1,406.14	51,888	3,370.78	15,866.34	5,288.78	21,155.12
Utah	27,281,280	6,261.19	44,919	2,918.05	4,324.19	1,441.40	5,765.59
Virginia	44,241,280	10,163.32	130,238	8,460.59	14,727.78	4,909.26	19,637.04
Washington	15,468,800	3,553.57	204,368	13,276.26	23,439.58	7,813.19	31,252.77
West Virginia	35,842,240	8,243.04	174,857	11,559.15	14,912.72	4,970.91	19,883.63
Wisconsin	62,664,960	14,395.70	238,538	15,496.03	23,739.07	7,913.02	31,652.09
Wyoming	1,937,100,160	445,000.00	20,081	1,304.51	15,700.21	5,233.40	20,933.61
UNITED STATES			6,850,104	445,000.00	890,000.00	296,666.66	1,186,666.66

Deduction for the administration of this Act . . . . . 110,000.00

Total . . . . . \$ 1,000,000.00



## (n) PAYMENTS TO COUNTIES UNDER MIGRATORY BIRD CONSERVATION ACT

(Permanent Appropriation, Special Account)

Appropriation, 1939.....\$15,000  
 Budget Estimate, 1940.....\$15,000

## PROJECT STATEMENT

Projects	1938	1939 (Estimated)	1940 (Estimated)
Payments to counties from receipts under Migratory Bird Conservation Act.....	\$15,087	\$15,000	\$15,000

## WORK UNDER THIS APPROPRIATION

Title IV of the Act approved June 15, 1935 (16 U.S.C. 715s), provides as follows:

"That 25 per centum of all money received during each fiscal year from the sale or other disposition of surplus wildlife, or of timber, hay, grass, or other spontaneous products of the soil, shell, sand, or gravel, and from other privileges on refuges established under the Migratory Bird Conservation Act of February 18, 1929, or under any other law, proclamation, or Executive order, administered by the Bureau of Biological Survey of the United States Department of Agriculture, shall be paid at the end of such year by the Secretary of the Treasury to the county or counties in which such refuge is situated, to be expended for the benefit of the public schools and roads in the county or counties in which such refuge is situated: Provided, That when any such refuge is in more than one State or Territory or county or subdivision, the distributive share to each from the proceeds of such refuge shall be proportional to its area therein; Provided further, That the disposition or sale of surplus animals, and products, and the grant of privileges on said wildlife refuges may be made upon such terms and conditions as the Secretary of Agriculture shall determine to be for the best interests of government or for the advancement of knowledge and the dissemination of information regarding the conservation of wildlife, including sale in the open market, exchange for animals, of the same or other kinds, and gifts or loans to public or private institutions for exhibition or propagation; And provided further, That out of any moneys received from the grant, sale, or disposition of such animals, products, or privileges, or as a bonus upon the exchange of such animals the Secretary of Agriculture is authorized to pay any necessary expenses incurred in connection with and for the purpose of effecting the removal, grant, disposition, sale, or exchange of such





animals, products, or privileges; and in all cases such expenditures shall be deducted from the gross receipts of the refuge before the Secretary of the Treasury shall distribute the 25 per centum thereof to the States as hereinbefore provided."

### SUPPLEMENTAL FUNDS

#### (1) Direct Allotments

Projects	Obligated, 1938	Estimated obligations, 1939	Estimated obligations, 1940
<u>Special Research Fund, Department of Agriculture: For special wildlife research.....</u>	\$17,180	\$22,810	\$24,000
<u>National Industrial Recovery Act (Wildlife Refuges): Acquisition, improvement, and development of wildlife refuges.....</u>	233,627	770,527	20,000
<u>Emergency Relief Appropriation Acts:</u>			
Improvement of wildlife refuges.....	1,532,038	855,000	- - -
Administrative expenses in connection with refuge improvement.....	51,434	51,500	- - -
Total Emergency Relief Act.	1,583,472	906,500	- - -
Total, Supplemental Funds (Direct Allotments).....	1,834,279	1,699,837	44,000

#### (2) Indirect Allotments

Projects	Obligated, 1938	Estimated obligations, 1939
<u>Emergency Conservation Work (authorized by Acts of March 31, 1933 and April 8, 1935; allotment through War Department): Work by Civilian Conservation Corps on wildlife refuges...</u>	\$1,872,631	\$1,344,000



## PASSENGER-CARRYING VEHICLES

The increase of \$17,915 submitted in the Budget estimates in the amount authorized to be used for the purchase of passenger-carrying vehicles is to provide for 17 additional cars needed in connection with increased funds recommended for 1940 and for replacement of cars now in use. Nine additional cars will be required for more adequate enforcement of the Migratory Bird Treaty Act, five for wildlife refuge supervision, one for the Mississippi Refuge land acquisition program, and two for administration of the Federal Aid in Wildlife Restoration Act. The remainder (93) of the 110 cars which it is estimated will be purchased in 1940 are needed to replace cars now in operation on various projects but which must be replaced by 1940.

It is necessary in carrying on much of the field work of the Bureau of Biological Survey to cover long stretches of territory by automobile, considerable portions of which are inaccessible by other means of transportation. The Government-owned automobile has been found to be the most economical means of transportation and a great time saver. It has been found a less expensive means of transportation when travel is extensive than to allow mileage rates to employees for use of their personally-owned automobiles, as Government cars can be operated more cheaply than privately-owned cars. Because of these facts, the Bureau several years ago inaugurated a policy of furnishing Government-owned cars for use of employees when the travel was sufficiently extensive to effect a real saving thereby.

Although much of the field service is now equipped with passenger-carrying cars, it is necessary in the continuation of this policy to keep the equipment in satisfactory running condition. This requires cars to be replaced at intervals, depending upon the mileage covered. During the fiscal year 1938, passenger cars operated by the Bureau showed an average operating cost, excluding depreciation, of 1.99 cents per mile. One hundred forty-five passenger cars turned in during the past five years showed an average operating cost, including depreciation, of 2.38 cents per mile.















